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HUMAN SEX ANATOMY

A TOPOGRAPHICAL HAND ATLAS

HUMAN SEX ANATOMY

by

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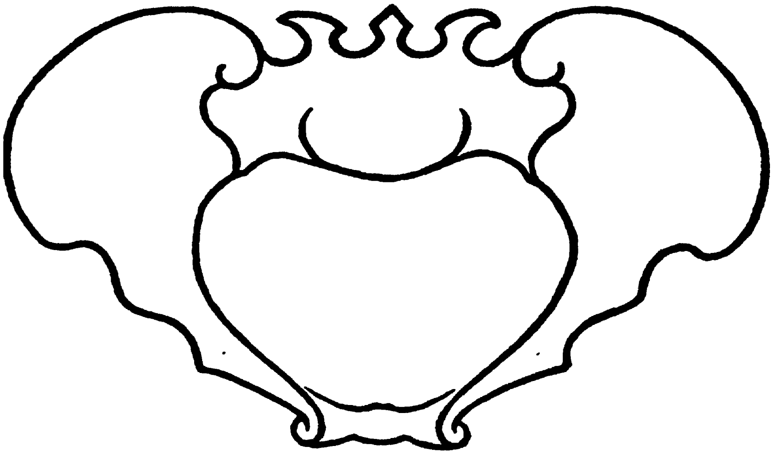

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To

HAVELOCK ELLIS

PHYSICIAN, PHILOSOPHER
PIONEER AND PROPHET

"IN *every department of medicine—and now at last in the most intimate of all—it is our business so to adjust the conditions of life that, if possible, . . . evils may not arise. There is no field in which it is more necessary than in that now before us for the physician to acquire a wider knowledge or to exercise a finer intelligence.*"

—HAVELOCK ELLIS, 1933

FOREWORD

It appears well within bounds to affirm that many of our present beliefs concerning average sex experience and normal sex life have the status of surmises standing on foundations no more secure than general impressions and scattering personal histories. It is time we began building on detailed case records running through lifetimes in series counted in tens of thousands. In view of the everlasting gonad urge in human beings, it is not a little curious that science develops its sole timidity round the pivotal point of the physiology of sex. Perhaps this avoidance—not of the bizarre and the extreme, of the abnormal and the diseased, but of inquiry into the general usage and physical sex conduct of mankind—perhaps this shyness is begotten by the certainty that such study cannot be freed from the warp of personal experience, the bias of individual prejudice, and, above all, from the implication of prurience. And yet a certain measure of opprobrium would not be too great a price to pay if we rid ourselves thereby of any basic fallacy.

Our protests against the sensual detail and the exaggerations and credulities of pornographic pseudo-science lose force unless we ourselves issue succinct statistics and physiological summaries of what we find to be average and believe to be normal, and unless we offer in place of the prolix mush of much sex teaching the simple statements called for in any sane instruction. Considering the inveterate marriage habit of the race, it is not unreasonable to demand of preventive medicine a place for a proper section on conjugal hygiene that might do its part to invest with dignity certain processes of love and begetting.

As to gynecology, the specialty having to do with disorders peculiar to women, it has been too much busied with the operative work that constitutes nearly one-fourth of major surgery to give proper time to certain fundamentals. We have trained medical students and hospital staff with an outlook on pathology rather than on physiology, on abdominal operation and repair of labor injuries, on inflammation and tumor growth rather than on normal function or life-adjustments or social sex problems. So far, the main subdivisions of the incipient science of preventive gynecology have been antenatal care, healing of every raw cervix, early diagnosis of cancer, and prophylaxis of venereal disease.

In 1923 the Committee on Maternal Health looked over the field, made a program to discover what data were missing and essential, and offered each study to existing agencies before undertaking it. There were great gaps in exact knowledge on many aspects of marriage and sex life such as sterility, the control of conception, sterilization, abortion; or premarital examination and physical maladjustments; or diagnosis and evaluation of various forms of sex experience such as autosexuality; and on actual basic anatomy and physiology of the sex relation, with the bearing of its varieties and frequencies on general health and pelvic disorder. All these called not for mere piling up of those guesses called opinions or convictions, but for analyses built upon elaborate medical records and researches.

To that end the Committee has for nearly ten years furthered this class of inquiry, has brought to publication seven books and some eighty articles and reports, and now has several other volumes ready or nearly ready for the press.

Because of the constant need for exact anatomy as a basis for all these considerations, it has been thought necessary to start at the beginning and to collate published material and issue hitherto unpublished data, offering as a basic outline the following rather personal volume, which may be called a grouping of pictorial averages, a sketchbook of the framework on which to mould the science—and art—of sex life.

The collection of material from which this book was made up is in the hands of the National Committee on Maternal Health, Inc., and will probably be turned over eventually to the library of the New York Academy of Medicine. This source material is available for consultation by physicians or other properly accredited persons, together with the valuable summary index of the eleven hundred books on sex topics in the Academy Library made by the Committee on the Evaluation of Sex Literature.

The author wishes to record his appreciation of the help rendered by various members of the Committee staff in the preparation of the manuscript: particularly, Dr. Louise Stevens Bryant, Executive Secretary, in editorial work, and Mrs. Penelope B. P. Huse in her painstaking preparation of the bibliography.

One-half of the pages of pictures are based on original drawings and measurements; another quarter of them cover presentation or assemblings that are novel. A large proportion of the original drawings are by the author, and all except those directly borrowed were completed by the author up to the next-to-final stage. The final stage for a very large number is seen by the initials to carry the tender and exact line and clear lettering of Mrs. Frances Hunter Elwyn. Of the half-tones four are by Alfred Feinberg, four by Robert Kendall and two by Mrs. Cecile H. Matschat.

For invaluable and detailed criticism thanks are due to Drs. Haven Emerson, George W. Kosmak, Robert T. Frank, who also contributed an important diagram, and Carl Hartman, all on the Board of Directors of this Committee; and to Dr. George L. Streeter. No publishers could have tendered more coöperation and encouragement than have The Williams & Wilkins Company.

And finally, author and Committee are deeply indebted to the New York Academy of Medicine for manifold courtesies, including five years' use of three rooms adjacent to the library; and to the Bureau of Social Hygiene and a number of other generous donors whose gifts have made possible the Committee's researches and reports.

Robert Latou Dickinson.

New York City
15 February, 1933

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ANATOMY, *says Harvey Cushing, appears "to the unimaginative to have been thoroughly explored: the pioneers have taken the surface washings, and rather than dig deep for gold, we prefer to look elsewhere for novelties and chance findings."*

CHAPTER I

PURPOSE AND METHODS

GAPS *in knowledge of normal anatomy of sex—Content—Bibliography—Collection of material—Sources—Form—Outline versus shaded drawing—Scale—Illustration of records and manuscripts—Obligation—Size of volume—Method—Superimposed tracings—Information available and missing.*

(FIGURE 1)

FOUNDATIONS are yet to be built and substantial framework provided for various parts of the newer scientific inquiry into medical aspects of human fertility. One might carry the simile further and affirm that while the superstructures, the spiritual and emotional and decorative elements of the architecture, have received full attention, specifications for the girders of the building have been neglected. It is time to start on the missing sections of what craftsmen call "working drawings."

No one aspect of human fertility or sex life can be properly investigated by itself alone. This holds good whether that aspect be sex education or marriage; control of conception or sterility; premarital instruction or conjugal maladjustment; abortion or sterilization of the unfit; or the dual considerations that are focal and ultimate, namely, the normal and the ideal. The basic things, the things that are steps toward betterment in health and morality and happiness, cannot longer be matters solely of theory and dogma. Marriage is beginning to be dispassionately studied. And not marriage alone, but all sex experience. The process is one of re-evaluation by wide collection and full presentation of data and by impartial interpretative analysis,—or at least an honest effort at impartial analysis. Embryology and biochemistry are assiduous and prolific. Omissions have been not so much historical, religious, legal, social or psychological, as medical, physiological and anatomical. The anatomical studies which might well have been among the first in order of time are coming along last of all.

CONTENT

Illustrations and text have to do with such considerations in anatomy and physiology as the following:

(1) Conditions favorable or unfavorable for conception.

(2) Conditions favoring or handicapping ideal sex intercourse, full orgasm and mutual adaptation.

(3) Physical conditions productive of painful intercourse or frigidity in women.

(4) Conditions bearing on coitus during pregnancy.
(5) Anatomical conditions affecting: (a) contraceptive devices; (b) abortion; (c) operative sterilization.
(6) Anatomical findings in autosexuality.

This atlas does not attempt completeness nor symmetry of presentation. Many topics adequately covered in the literature are deliberately avoided here. It busies itself with neglected aspects of form and function, with practical issues, with newer claims and findings, together with programs of study.

Thus the relation of drawing and text does not pretend to be systematic. A given subject may be presented both by picture and text, or by picture alone or, rarely, by text alone. Where an illustration and its legend, or a series of cuts and captions seem fully to tell the story, they may be passed by in the text in order to save space and duplication. Where drawings are cut out of patients' records, as very many are, they carry not only the case number in code, but a note on relevant parts of the history. They may or may not be referred to in the text.

BIBLIOGRAPHY

The Bibliography, beginning on page 120, contains only titles actually consulted in the preparation of the atlas. References to source material, both as to text and illustrations are given quite fully, first in the list of illustrations, second by names of authors in the text proper, and third in the legends of the Figures and finally in the Bibliography. It is to be assumed that any book or writer mentioned will be found in the Bibliography.

Where there is more than one reference cited for a given author this is indicated in the text by a number or by a date corresponding to the equivalent in the list of titles under each author's name in the Bibliography.

COLLECTION

The gathering of the material on which this book was based was far advanced before any thought of publication arose. When medical librarians began persistently to demand photostats of the bulky source books and a prominent medical publisher urged issuing at least the chief of the sheets and the summaries, the present selections from the material were made; they have been submitted to some of those best qualified to furnish opinions on what seems actually serviceable.

Such selection has not been altogether simple. As an example of elimination one may take the evidence bearing on the shape and size of the cavity of the uterus. There were in hand a large number of sheets with some 360 drawings or tracings from specimens or roentgenograms, many of the pages showing one outline, others twenty detailed pictures, besides the books and papers on the subject. From the mass some ninety samples were finally chosen.

As another instance one may note that in the preliminary study for the construction of a standard median section of the pelvis, it is believed that no published section of a cadaver has been overlooked, while all texts and tables of measurements have been consulted. Furthermore, in important matters the steps of the process of making an average have been freely set forth in this atlas in order to allow others to judge of the competency of the method and the validity of the evidence, and our much used scheme of superimposed tracings may be shown to be useful for finding averages and distribution and extremes.

In the standards here offered and in these picture-summaries it is hoped that medical artists and authors will find serviceable basic outlines from which to build future illustrations and measurements in this area, and that general adoption of and adherence to a given scale or set of scales may prove to foster easy reference and comparison.

SOURCES

Anatomy was tapped. Every section of male or female pelvis in two of the largest medical libraries of the world has been transferred to tracing paper, using the same section as many times as it was necessary to take off each anatomical feature which was to be studied. Aside from the books on anatomy, there might be, for instance, sixty frozen or formaldehyde cadavers from which one could get a median section that would show the vagina of the non-pregnant woman, free from injury in childbirth. Then one could superimpose the whole or any special grouping and study averages.

To study the living one took casts or measurements of the vagina in various postures and also made the muscles print themselves on a thin wax cylinder; or one looked at vaginal walls while a glass cylinder of the size of the phallus was pushed in, in any direction that a phallus could follow. These are examples of how much new exploration there is to be done.

In contrast to most anatomies these pages try to depict the tone of living tissues. There is marked contrast in form and position between the quick and the dead. The post-mortem uterus droops, the scrotum sags, the anus gapes widely. All are here restored.

FORM

By avoidance of realism in the illustrations, by minimal graphic statement, and diagrammatic representation wherever possible, it was thought that erotic suggestiveness could be largely eliminated. Such was the first form of the drawings, as in the hundred and fifty outlines used to illustrate our manual, "Control of Conception." Later it was found that structure must be filled in on certain drawings to make clear either mechanism or physiology. As the reserved pictorial statements in the manual were found to be acceptable, the present further step, a restrained form of more detailed picturing, is here offered. Outline or diagram is retained, however, wherever such synopsis suffices to make the statement.

OUTLINE VERSUS SHADED DRAWING

The delicate gradations of the halftone illustration render textures and modelling well and supply prettiness. They have their place. But for that directness which resides in simplification the diagram is usually better suited. The drawing made in lines or dots may take longer to prepare if it attempts shadings and detail, but it is cheaper to reproduce, the block wears much longer, and from it any other author can have a direct reproduction made, as is not the case with the halftone which gets its effects by very minute dots, usually 130 to the inch. Moreover, the zinc block done from the pen drawing can be printed on unglazed paper free from annoying reflection and produce a light-weight book in contrast to the heft of the volume with coated stock on which halftones have to be printed. In this atlas many of the life-size diagrams look rough in line because they are made into cuts of the same size as the originals. It takes reduction to develop delicacy.

SCALE

Always, if practicable, *life size presentation* is employed. It is the most faithful for teaching. It facilitates comparison. It permits showing the pages when teaching small groups. It familiarizes one with actualities. It is best in entries on office histories and after operation. It permits of ready reproduction if copies are desired. It is only when juxtaposition of a number of variants or steps are required for comparison that a lesser size is used, and then uniformity is sought by the general application of one scale, of which the main example here is the one-third scale in the section on contraception.

Sections and diagrams are turned in the *same direction for each sex*, and male and female face each other for obvious reasons. Thus any median section can be readily compared with any other of the same sex. This has seemed to be of sufficient importance even to warrant reversal of sections taken from other publications.

Because of the conditions under which the vaginal examination is made, and because the usual posture in coitus is the *recumbent dorsal* with the knees bent, almost all of the median sections are placed in this attitude. This is the posture from which the gynecologist makes his mental picture, and this is the way we may most reasonably consider what usually happens in coitus. Study of what happens to the pelvic organs in the upright posture belongs to bodily mechanics in physical education and to research in attitudes when at work; to the consideration of support of displacements by pessary or operative restoration of torn or prolapsed structures; to corsetting in the obese and the like, but hardly here.

ILLUSTRATION OF RECORDS AND MANUSCRIPTS

Any doctor or operator, but more especially any author or prospective author, does well to train himself to be his own illustrator either wholly or in some degree, however modest. Even the simplest sketches count. He secures results otherwise impossible in the way of his own and others' understanding of conditions found during examination or operation. He trains himself in exactness and detail of record. He saves himself laborious description in words. He can lay down for his medical artist an outline of what he wants shown, and then designate for him those pictures in the medical literature which best show texture. Best of all are his results if he can take any drawing when it has been finished to the limit of the artist's understanding and correct or complete it in such fashion that there is no evidence of patch or addition. As an example, there may be cited the present author's results in the American Textbook of Obstetrics (1895).

An author can train himself by beginning with diagrams, made over such outlines as are published in this volume, and do this both in operating room and office. The degree of retroversion at the first and at subsequent visits, the dimensions of the tumor, the location of the exudate, the amount of protrusion of the prolapse, the degree of recurrence—these are examples where a jotting in pen or colored crayon on a picture chart are worth a quarter-page of descriptive wording. Thus, as the years go by, one becomes able to illustrate lectures or articles. The author's office histories average ten drawings apiece, and some carry over sixty; they are drawn to scale as a rule, are occasionally in color, and in the later years are full size from actual measurements.

OBLIGATION

The artist-author is continuously in debt to the great general anatomists and gynecological anatomists. One could not with grace refer to the many uncredited borrowings of his own originals during a half century did he not attempt to render full credit to others and to acclaim the growing practice of statement of source in legends.

The chief indebtedness is to Germany. In that land where there were giants of old the stride has not shortened, whether on the paths of discovery or in perfection of presentation. In a list that cannot touch more than the high spots in topographic pelvic anatomy one names first Waldeyer, then Henle, Braune, Bayer and Kraus, Heitzmann, Sobotta, Rauber, Kopsch and Tandler, with emphasis on the last; the Bardeleben group, including Eberth and Fick, then the Schroeders and the Schultzes, Bumm, Stoeckel, Martin, Halban, Peham, and Schubert, with emphasis on Sellheim, Liepmann and Stieve.

The second great obligation is to France, to Testut and Jacob, to Poirier and Charpy, Rieffel and Delbet, to Varnier and Rouvière; and particularly to the 1931 Testut of Latarjet, as well as to Jayle with his multiple presentation.

To the anatomists of England and America the obligation is less, with important exceptions, such as Savage, Hart, Barbour and Webster, Foster and Piersol and the great impulse due to Howard Kelly.

Little in anatomical art excels the splendor of Strange's plates of Rymsdyk's drawings in Hunter, the tender delicacy of line drawing by Leuba in Poirier, the rich clarity of Faraboeuf, the tissue rendering of Unger and others in Spalteholz, the clean woodcuts of Toldt, the force and teaching quality of Mollier, the brilliance of Broedel with his wide influence and able pupils, and, most recent of all, the perfection of full color and careful modelling in Braus.

SIZE OF VOLUME

The atlas has been made small enough to fit on shelves of the usual height so that it need not stand with big volumes of low visibility on the floor shelves of the library, or else lie on its side under others, difficult to haul out and, if much used, eventually fall to pieces from its own weight and bulk. Appearance has been deliberately sacrificed to handiness, since the larger drawings present no comely mat of margin. The controlling reason, however, for the standard letter sheet dimensions, 8½ by 11 inches, is that the book may be conveniently locked up in the stock vertical file until such time as everyday medical data like these are as commonplace and as clear of reproach and as clean of approach as any other anatomical figures. Though margin and setting be cramped, the atlas style of binding, as in geographies, permits the double page to lie open, and this allows depiction of the whole lower trunk of the standing or lying figure, full size, and even has room for advanced pregnancy, or both breasts at once.

There is a propagandist reason for the size of the page. The present general American usage for hospital histories is the standard letterhead sheet, 8½ by 11 inches. This atlas demonstrates that the life size diagram of several regions of the body could become a matter of course in such records. A number of samples of hospital history blanks are included in advocacy of such life size diagrams (Figs. 14; 18; 19; 48; 49 and 74).

When the author graduated many years ago from rubber stamps, or printed slips pasted on, with their proportions one-fourth or one-third life size, he found the thickness of additional pages involved in large drawings or extra sheets amply compensated for by new conveniences. A pessary or a tumor could be laid on the history sheet and traced around its margins; the finger with its convenient one inch joints could be handily laid on the paper after vaginal examination to enter the distance to the cervix or by its diameter be used to record the size of the opening of the hymen. The obstetric calipers could be laid across the page. Indeed the doctor found he was teaching himself surprising things every day.

METHOD

In presenting a section of Anatomy for anything but a manual, one should not only state the conclusions reached, whether tentative or final, but also the method or steps by which they were reached. In a relatively new field this is especially to be desired. Therefore, this atlas will be elaborate in spots. Even in dimensions on which there is general agreement, re-examination of the authorities has been found to be worth while. A further, and less usually explained item will be a demonstration of the range of variation in a given measurement or location of an organ. The bony pelvis has already been spoken of as an example of re-examination of standard forms; the hymen and the clitoris are organs about which we have had little in the way of series of anatomical records from which to figure averages. Perhaps the most striking hiatus is in dimensions of the erect penis, for there seems to be no published table of measurements; nor has one been able to find on what the figures in textbooks are based, in the very few anatomies that give any figures at all.

There are some anatomical points that seem to run rather true to form; there are others in which a wide variation appears to be the rule. As an example of the first one notes in tracing sixty-four life-size median sections in women without prolapse or major injury to the pelvic floor, that the outlet to the vagina, the hymen opening, is found to be singularly uniform in its relation to the subpubic arch, a square of 1.5 centimeters or the area a finger-tip will cover, embracing four-fifths of the samples (Fig. 1).

On the other hand the thickness of the tissues over the pubes, the mons and labia majora, show a consistent inconsistency. This one might have expected, as the vaginal outlet is an opening circled by relatively inelastic fascia (Fig. 134), whereas the depth of the vulvar funnel is a matter of fat layers (Fig. 95). The first has significance for a sex anatomy because difficulty in adaptation during coitus has been often credited to rearward displacement of the introitus. This is shown to be unlikely in those races represented by our available anatomical sections (Fig. 98). The second has meaning in that the depth of the canal the phallus is to penetrate is partly determined by the presence or absence of these adipose deposits (Figs. 60; 61).

AVERAGES OBTAINED BY SUPERIMPOSED TRACINGS

The most direct form of anatomical statement is pictorial; in its most facile comparisons it uses matched diagrams, the shortest of such shortcuts being the multiple overlying tracing. Any grouping of shapes and locations lends itself to such treatment, and the wandering of organs is thus best recorded. Naturally, any group of tracings must either be on the same scale or converted to the same scale before being superimposed. However, angles or relative locations may sometimes be read off directly and entered on a diagram, as for example, the angle of tubal openings in reference to the general uterine cavity or the axis of the erect penis in relation to the trunk. Three examples may be noted at this point.

To exhibit common differences, Figure 5 superimposes as many sacral tracings as may be placed one over the other without too much confusion or blurring. When one line exactly fits over any other in any considerable portion of its course the two have only the value or emphasis of a single line unless care is taken to double the thickness. This requirement, however, is infrequent. Our primary consideration is election of the pivot, or common point of departure, and the common axis (Figs. 24 to 27). Here the promontory may be the pivot, and the inlet the common axis. In Figure 5 the lower end of the symphysis and the outlet are chosen.

Laid one over the other, some of Schubert's roentgenograms of the pelvis taken from the side, give a very interesting relation between the top of the symphysis and the promontory and also between the inclination of the plane of the inlet at various ages. Figure 6 shows, with the child in the upright posture, a promontory standing almost above the symphysis (this length *not* due to fusion of the last lumbar); then in the adult a retreat of the promontory upward and rearward; and then for old age a drop almost straight down from the adult location. This observation cannot be taken as final until shown to be usual, and until Schubert's shadows are known to be entirely comparable one with another, but the old age sag appears confirmed by some of the sections of the prolapse cases of the Halban-Tandler series (Fig. 5).

As a third example in comparative registration the location and mobility of the *clitoris* may be cited. In searching through anatomical plates drawn from actual sections one finds the crura of the clitoris shown reasonably often, but the glans (or the section) seems to fall so seldom in the median line that it is infrequently represented. Thus tracings taken from 24 median sections, seen in Figure 77a:B show the top of the arch of the cavernous bodies ranging in position from the bottom of the symphysis upward over two-thirds of the front of the bone, and indicate a median point one-third of the way up the bone.

The outermost tip of the glans in cadavers is represented in Figure 77a:E by dots, whereas the crosses show the usual position of the quiescent glans as drawn from about three hundred entries in my case records. The average location of the glans is therefore believed to be at right angles to the junction of the lower and middle thirds of the symphysis, with a projection of 2 cm., or less than one inch. Excluding intersex findings, the extremes of size and protrusion found in the sections is indicated in Figure 77:C. From these I construct the average for the non-erect clitoris in median section in Figure 77:A to demonstrate the method.

Figure 11 was drawn from a series made from several hundred women traced in the upright posture, and has been confirmed by a number of repeats with many of the individual patients. I have always avoided the false proportions that are inevitable with any method that depends on shadows or photographs. They are invariably distorted. The best way to avoid distortion is to trace the outline of the body. This may be done by a perpendicular dropped from every point to the paper, made by a pencil fast to a right angled support; or else by a complicated machine which protrudes a multitude of blunt points against the silhouette. The simple pencil method works well against any large drawing board two feet by six, or a piece of the inexpensive veneered "ply-board" used for panels (Fig. 12:A).

But Figure 11 is an example of defective procedure in superimposing tracings, because when one takes off on thin tracing linen, or tough tracing paper, as many as forty of these life size outlines, it becomes difficult to disentangle the individual lines. Even with a numeral at rather frequent intervals along each line, identification is not easy. In the original life-sized drawing made for this figure the lines do not, of course, blur and run together anything like as much as they do in the reduction. Nevertheless, for clarity too many lines can be included in any particular figure. And yet, even so, one can profitably note trends in this diagram, as in back and breast and paunch.

A better result is obtained by selecting groups of relatively similar forms, such as those with thin trunks and those with thick trunks, and then comparing either the groups or else their type individuals. This applies as well to a single part of the anatomy like the buttock, or to attitudes, such as the "gorilla" stoop or the "kangaroo" forward-leaning posture (D. and T. 1912). As the final step or summary the average or normal may be indicated by a thick line or a red line.

In the instances here given it will be noted that the old idea of the desirable posture is shown by the dark line with shoulders forward, in the attitude of military tension. This notion is now giving way to the belief that for normal balance the shoulder silhouette should stand nearly above the buttock silhouette with much less dorsolumbar curve.

Trial of the scheme soon teaches any one the applicability and limitations of superimposed tracings, whether these are made in their natural size or are enlarged from photographs by pantograph or projectoscope for convenient and profitable comparison.

Incidentally one cannot help registering satisfaction, in these days of complicated laboratory research, in being able to show that there are profitable studies to be carried on with simple outfits—with no more equipment than patience and pencil and paper plus an adequate medical library, or good case records, or people willing to be studied.

INFORMATION AVAILABLE AND MISSING

The outline of topics (on page 10) gives estimates concerning data published, or available unpublished, on each of our topics, and thereby exhibits the extent and range of our ignorance concerning the anatomy involved in human sex studies. Search has been made by the author in the greatest of all medical libraries, that of the Surgeon General (now the Army Medical) in Washington; in that of the Academy of Medicine of New York with its accessibilities and courtesies; and in libraries in Vienna, Berlin, Paris, London and Rome. Special collections such as those of Moll in Berlin have been visited, and professors of anatomy have been questioned in a dozen countries. As a result it may be claimed that this volume provides the first considerable collection of data on the following matters:

(1) The female *pelvis* in relation to sex intercourse; its outlet, axes and coital diameter; also standard life-size outlines for gynecological and obstetrical histories;

(2) The *uterus*, the shape of its entire cavity, with its rhythmic contractions and periods of quiescence in different parts of the intermenstrual cycle;

(3) The *ovary* (and tube) palpated during

the cycle, to determine time of ovulation;

(4) The *nipple* and areola, their sexual excitabilities;

(5) The *vagina*, its forms and distensibilities;

(6) The *vulva* in drawings to scale, showing the bearing of a variety of conformations on coitus and sex response, and of sexual practice on dimensions and erectilities; and forms of the funnel of entry;

(7) The *clitoris* in its dimensions, location, erection, excursion;

(8) The *hymen*, its shape when deployed, and its varieties with the import of the range of distensibilities of the vaginal opening;

(9) The *meatus* in relation to autosexuality and coitus;

(10) The *penis*, its measures and variants, and its angles, erect, and within the vagina; and the intersex copulator;

(11) *Coitus*, the differing anatomical relations with varying postures; the inter-relations between penis and clitoris pressure and hymen entry; contacts between male meatus and external os during ejaculation; some mechanisms affecting success or failure of the female to reach orgasm; and various physical reasons for dyspareunia and frigidity; and finally,

(12) *Anatomical evidence* of sex experience.

There are several matters quite closely related to my topics which are so fully treated in standard works that they do not call for repetition here. As examples, one may mention the microscopic anatomy of the ovary and of the lining of the uterus and tube. On the other hand, here is frank trespass on histology in considering erection, and on physiology wherever the anatomy of action can more readily be understood when associated with specific study of function.

TERMINOLOGY

General agreement on the meaning of words is important in any science, but particularly in a nascent science like sexology. For anatomy, since the Basle Conference, there is a standard terminology. A "Standard Classified Nomenclature of Disease" has been recently developed by joint action of the national medical, surgical and specialist societies in the United States in cooperation with Federal departments and public health, insurance and statistical bodies. (Edited by Logie, 1933.)

As far as they apply, such lists should be used in sexology. Our anatomical requirements are largely met, but there are terms for the function of a given organ and for practices or devices which the anatomist needs clarified. What for example is a really satisfactory verb for action in coition? To cohabit, to copulate, to be copulated? The verb most used is taboo. Does "withdrawal" include coitus reservatus? Shall "pessary" include the medicated suppository, as in British usage?

As a further example, the first considerable medical book on contraception in English calls the reach of the penis into the further recess of the vagina penetrating the "*cul de sac*." *Cul de sac* is reserved, except among the French, and occasional earlier English medical writers, for the pocket of peritoneum dipping down between uterus and rectum. The last thing the author had in mind was the extremely rare rupture into that pocket resulting in peritonitis. Even momentary confusion is avoided by the usual term for the extension of the vagina beyond the cervix, namely "posterior fornix."

I have urged Havelock Ellis to prepare or else to initiate and direct the collection of a list of desirable terms and definitions that shall cover human sex functions. His latest volume (1933) contains a glossary. Our Committee on the Evaluation of Sex Literature needs an index for its card summaries and abstracts, and can not readily meet the request for publication without an authoritative classification and nomenclature (See Medical Aspects of Human Fertility, N. C. M. H. page 17).

INFORMATION PUBLISHED OR ASSEMBLED AND MISSING DATA

Subject	*Material available*	*Original items of observation for this Atlas (estimated)*
Male Anatomy		
Pelvis:		
measurements, axes, pictures	ample	0
Penis:		
prepuce	ample	12
location on symphysis	moderate	8
measurements erect	scanty	36
mobility or range of attachment	scanty	0
meatus and its direction of exit	scanty	0
angle erect, statement or diagram	scanty	12
shape erect, statement or diagram	scanty	8
Female Organs		
Vulva:		
location and relation to bones	ample	20
size and development; measurements	moderate	800
variations in shape (Hoffmann, Jayle)	moderate	300
as a funnel of entrance in coitus	scanty	40
drawings to scale	scanty	400
shape in drawings, exact and detailed	scanty	500
meatus as cause of painful intercourse	none	40
Clitoris:		
enlargements; variants	moderate	50
location on symphysis	moderate	100
shape, flaccid or erect	moderate	500
size, flaccid or erect, measurements	scanty	200
excursion of tip or glans	none	200
projection beyond bone	none	200
Hymen:		
injuries	moderate	300
shape (Jayle, Hoffmann)	moderate	300
variants, most unpublished (Hoffmann collection, Vienna)	moderate	200
size by measurement	scanty	400
distensibility	none	500

Subject	*Material available*	*Original items of observation for this Atlas (estimated)*
Pelvic floor:		
in relation to coitus	moderate	0
fossa navicularis in dyspareunia	none	20
Vagina:		
injuries	ample	0
length	ample	100
axis or direction	moderate	100
variants	moderate	50
distensibility	scanty	100
drawings, distended vagina	scanty	100
Uterus:		
cervix:		
location and mobility	ample	250
size, measured	ample	500
insuck in orgasm	scanty	5
shape	moderate	500
descent in orgasm	scanty	20
interlock with penis in orgasm	none	0
body of uterus:		
size, shape, mobility	moderate	318
whole uterus displacement in coitus, in orgasm	none	20
Pelvis: action in various coital postures	none	40
Postures in coitus and their effect	scanty	50
Contraceptive devices:		
Anatomy of	scanty	150
Diagrams of same in action	scanty	150
Pregnancy and intercourse mechanisms	none	20
Displacements and coitus physical studies	none	50
Posture and retention of *semen* in sterility	scanty	50

CHAPTER II

THE BONY PELVIS

NEED *for standard outlines—Discrepancies in texts—Median section—Half pelvis—Sagittal section—Measurements and axes and common variants—Coital pelvic diameter—Plane of outlet—Life size charts for histories.*

(FIGURES 2 TO 12a)

ANY TEXTBOOK on anatomy shows the forms and diameters of the pelvis. Anatomies and gynecologies all exhibit sections of the pelvic organs with organs in place and in such works substantial agreement is found on the more important forms and dimensions. Nevertheless there is extant a considerable amount of quite incorrect picturing; some of it between the covers of high authorities. The medical artist or author needs, for any new anatomical illustration, a standard outline to start from, bearing those dimensions generally accepted, from which to select what he requires. For this reason the data on any standard form should be complete. Even when making a drawing from life such a standard is necessary in order to check for significant variations or to suggest omitted items.

The size of the uterus and the angle of the vagina are noteworthy instances of frequent error in anatomical drawings. Thus Testut's median section with its triple-thick urethro-vaginal septum is frequently copied as if normal (Fig. 77:B). Another striking example is in connection with presentations of the lower part of the male trunk wherein the text states that the spermatic duct is 2.5 mm. in external diameter and that the ureter in its various sections runs from 6 to 12 mm. (Fig. 107); yet in the illustrations they are made the same size.

STANDARD FORMS

As an introduction to the chapter a *median section* of the female pelvis and its contents is given in diagrammatic form in Figure 3. On this I present a new item for pelvic outlines by designating the endings of the pelvic diameters by dots as a ready method for checking. The woman is standing and the parts are virgin. It will be noted that the cervix is very near the coccyx. It is depicted thus, instead of on the level of the spine of the ischium, as usually given, as the result of the recent series of X-rays by Schubert which he took with a flexible stem in the cavity; and it coincides with the famous and generally forgotten outline of B. S. Schultze. The higher position is correct, however, for the supine position. The ovary hangs nearly on end above the top of the uterus and the simplified tube swings around it. The vagina shows its flattened S shape in the form of the "curve of beauty" of Hogarth. All these questions are taken up later in relation to Figures 14, 20, 24, 26, 27, 51, 52.

Figure 2 gives the bony *half pelvis* for comparison. Inlet and outlet follow the most generally accepted relation to the horizon for the upright posture. Some leaders in the newer physical education object to the military attitude with the strong incurve of the lumbar region shown in Figure 12:B and direct a posture which, while straightening this hollow back, brings the inlet to an angle less steep, and makes the outlet nearly level. Our concern is chiefly with the recumbent figure, yet we show a few superimposed tracings made from life size drawings of standing figures by my simplified method many years ago (Fig. 11).

Figure 4 is the outcome of elaborate comparison of the authorities, and is here submitted as a *standard* for the *sagittal section* of the *female pelvis*. It contains all diameters and axes, with their measurements placed upon them, and also gives distances and projections for the pelvic floor of the virgin or nullipara. It is placed across the page because vaginal examinations and coitus usually take place with the woman on the back. Here, however, the legs are straight (as they are not in either of these situations) in order that the book can be held sideways to contemplate the plate in the equivalent of the standing attitude. There is a difference of about 10 degrees in pelvic inclination in the recumbent posture with knees bent as compared with legs extended, as shown in the outlines of the outlets in Figure 9.

Figure 7 states the more important *differences* in statement in the matter of diameters and axes. These are drawn from collections of published measurements, or statements by anatomical or obstetrical authorities. Allowance is always to be made for the dry state of the pelvis because drying alters both diameters and axes. We should use as a standard the measurements of the living, and it should always be understood which is referred to. Unless otherwise stated, this atlas uses living data.

COITAL PELVIC DIAMETER

Certain considerations having chiefly to do with obstetrics are omitted, like the Walcher extreme trunk-extension posture (Fig. 9:D), attention being given chiefly to the dimensions and axis of the outlet and cavity as conditions bearing on coitus, its facility and comfort. The distance from the subpubic arch across the cavity of the pelvis to the bony wall opposite, the front of the sacrum, is important. This distance may be dubbed the *coital pelvic diameter*. It averages 13.5 cm. or 5¼ inches. This, as shown in Figure 8 is the measure taken in the bare pelvis, and it takes no account of the thickness of the soft parts, that is the rear wall of the vagina, the double walls of the rectum, and the loose tissue between vagina and rectum and in front of the sacrum. These soft parts are almost negligible except as a cover less thick than layers of thin goods, as one knows from palpating the front face of the sacrum in hunting for tender sacral nerves at their points of emergence (Fig. 128). The reach of the tips of the examining fingers is seen in Figure 56.

The antero-posterior diameter of the midcavity of the pelvis given by Edgar and De Lee (Fig. 7) is a centimeter longer than our standard of 14 cm. (Fig. 4) and may be the size for the American type pelvis. To a long phallus this would be an accommodation. It is not to be overlooked, moreover, that in several of the groups taken from source material (Fig. 5) there is a rather frequent pocket located in the sacro-coccygeal curve just where it would be of most service, above the joining of the two bones. On the other hand we do not fail to note, as a possible cause for discomfort for both the woman and the man, the shortening of the coital pelvic diameter shown in some of the superimposed tracings in the same figure. This limitation, as compared with the average, may be seen to be as much as 2 cm. or ¾ inch. Here the glans would make strong impact if the male organ were of average length.

In any consideration of the coital pelvic diameter one must remember that the depth of penetration and the total length of the canal is partly fixed by the soft parts outside of the subpubic arch. This added length is 2.6 cm. or 1 inch, as shown in Figures 1 and 95. The average phallus being supposed to be 15 cm., or 6 inches, the average canal seems to be the same.

Phallic Cushion. Among other factors affecting the reach of the male and the impact on bone to be taken up later, is that interesting provision against injury by, or to, the thrusting rigid rod, the erect penis. The shaft, the fully distended corpus cavernosus, is as hard as bone, but the sharp point of it is capped by a cushion of *elastic* erectile structure, the glans, apparently in order to avoid damage to vagina and to penis. This is shown in the chapter on male anatomy (Figs. 110; 123).

Thus sacrum and coccyx together make a scoop of bone with the point downwards, the sacro-sciatic ligaments and pyramidal muscles forming its lateral aspects. It is into the lower third of this hollow, apparently, that the shaft penetrates nearly to the bony wall. The practical importance of this formation is that any mass lying in the sweep of the hollow may be struck by the head of the penis and cannot get out of its way, crowded as it is against the bottom of the curve. A mass of feces in the rectum; an ovary displaced (Figs. 149:B; 53:E) and usually swollen and tender, or the body of the retroflexed uterus (Figs. 146:F; 53:F) may thus give rise to dyspareunia. In any case of painful intercourse such mechanical causes should be in mind. That I have not found dyspareunia oftener associated with extreme retroflexion is partly explained by the diagrams of vaginas pictured under that heading (Figs. 61; 146:F; 149:D).

The penis, in stretching the vagina to accommodate its length, has to pass one side or other of the cervix and distends the lateral fornix, leaving a side pocket as record and explanation (Figs. 149:D; 62). Also we recognize that, at least in a wide pelvis, extreme degrees of backward displacement are to be found with no tenderness (or pain at the periods) in the absence of inflammation. Posterior parametritis, with rigid or tender utero-sacral ligaments as a cause of dyspareunia, probably is to be explained rather by displacement or drag on the cervix than by direct impact. The marked excursion imparted to the cervix during coitus is shown in Figures 143 and 141. General peritoneal tenderness is well described by Gellhorn in his Presidential address of 1932.

PLANE OF OUTLET

The angle or plane of the outlet has a considerable bearing on the mechanics of successful and unsuccessful intercourse. The slant of the outlet is apparently largely determined by spinal conformations and those dorsolumbar curves which are dependent on attitudes in standing and sitting. These affect the angle which the planes of the pelvic inlet and the pelvic outlet ordinarily assume to the long axis of the body. We shall show later that the angle of the plane of the outlet is the main factor in determining whether the vulva is readily accessible or not and that the old notion of the opening as situated very far front or very far back seems a myth, as far, at least, as modern white peoples are concerned (Fig. 98).

The range or alterations in this plane of the outlet in ordinary bed postures, as recorded in personal observations, is given in Figure 9, together with its relations to the vaginal passage. With the legs straight on the bed (A) the coccyx is behind the line dropped from the subpubic arch, while the axis of the vagina is about 60 degrees. If the feet are drawn up and the knees moderately bent (B) this relation changes and the vaginal axis grows steeper. When the thighs are more strongly flexed with the knees approaching the shoulders, so that the buttocks rise from the bed, (C), the vulva becomes much more readily accessible, actually by 4 cm. (1½ inches), and the angle of the vagina steeper, or about 72 degrees from the horizontal. No other position whatever provides for retention of semen by gravity as does that with elevated buttocks, as shown later (Fig. 152).

If the Schubert group of X-rays showing conditions as seen from the side are confirmed, then we should find a rather stable relation between the lower end of the symphysis and the lower end of the sacrum and coccyx at different ages, that is, a stabilized outlet as compared with a changing inlet (Fig. 6). There seems to be a very marked alteration between youth and old age in the relation between the top of the symphysis and the top of the sacrum, the promontory. If confirmation of Schubert develops, then we can affirm that as age becomes more advanced the pelvic cavity shoals and its coital diameter shortens; but if the older woman has a mate of equal age this disability will have been discounted by his lessening rigidity.

As noted before, the sections are all viewed from the *same side* in order to be readily compared and a borrowed section, if viewed from the opposite side, is reversed. In general the *pelvic outlet* of a woman *in the dorsal posture* with feet on the couch or in the footrests of the examining table is made the criterion for placing the drawing on the page, as this is the situation when the physician examines the patient and this is the usual situation during coitus (Figs. 9:B; 15). This is in the interest of bringing some order out of our anatomic chaos. For not only is the woman represented indifferently in books on anatomy, gynecology or obstetrics, as standing or lying; but all kinds of scale or no scale is general, even in extensive collections of original plates; and one finds, even in a monumental atlas, such carelessness as the presentation of pelves set at all angles. In pictures of frozen or hardened sections one finds often a variation of 30 degrees between one drawing and the next, though both were made from the same body in the recumbent posture with legs straight.

We need, for certain considerations, to depict the pelvic organs and the pelvic tilt in the upright posture but these considerations affect us little in this book. What we must have in all published sections is: first, posture clearly stated; second, comparable presentations, and third, invariable indication of scale. A fourth requirement is simplification of statement by selection of those items which have a bearing on the part being studied at the moment, even if the same specimen has to be used over and over again in developing different points. Frequent reference to some distant page for comparison does not make for efficient teaching.

To accustom ourselves to actualities, the *scale* is *life size* wherever it is not wasteful of pages and space. This seems to be the first atlas elaborately attempting the combination of handy all-over dimensions with full scale pictures. It is a frank experiment in this line.

LIFE SIZE CHARTS FOR HISTORIES

For entries of growths and displacements and exudates and for record of operations I plead for use of full size charts. A few samples of such charts follow. Some of these I first worked out for Dr. George Gray Ward for the Woman's Hospital in New York for study of the locations of cancer and areas of extension and recurrence, but these outlines are serviceable for any gynecological work (Figs. 14; 18; 19; 49; 73). (For the male, see also Figs. 105; 106.)

The matter is purposely treated in a diagrammatic fashion. Thus in Figure 14 the vagina is opened up to give room for recording any malignant masses or a polyp or an enlarged or anteflexed cervix. Figure 19 has had to be even more diagrammatic as one cannot deploy the vagina full length and show the full cavity of the uterus in the same plane. The insert at the right lower corner shows the angle between the vagina and uterus that had to be straightened out to do this; and the insert on the left lower corner shows, by the long crossed lines, what a compromise had to be made so as to use the lateral pelvic walls with such a scheme. The tubes and ovaries were also deployed and lifted to get all parts in view for the surgeon's entries.

Figure 18, the inlet from above with pelvic contents, puts the heavy line of the border on the inlet along those firm "soft" parts that we must learn to recognize clinically as the true and practical limit rather than the bony brim, here depicted in thin line.

These diagrams would be clearer and more decorative with the contents or soft parts in a different color, such as brown. As black and red are the colors in which entries are most usually made, black and red should be avoided in printing these charts for histories. The big charts (Figs. 48; 128; 131; 140) are shown mainly to demonstrate the possibilities of two-page flat treatment whenever large areas are needed, as in orthopedics, bone recurrence of cancer, inguinal or femoral hernia. Also (Fig. 49) the breasts are thus shown and even full time pregnancy may be thus pictured (Fig. 48).

Another important use for such life size charts is in clinic teaching. They are hung on the wall in operating room or clinic. A student may be requested to draw what he finds on bimanual examination. To do this he will have to make an exact observation. The surgeon, who cannot let more than two or three peer into the belly through the usual short incision, can have a non-sterile assistant outline the location of an appendix or small fibroid which is invisible to onlookers. Another use in clinic or operating room involves fastening the series against a window pane with a section of thin ground-glass over the diagram; the lines show through. The teacher can then draw on the ground-glass with chalk or crayon. He erases the marks for demonstration of the next patient's pathology. Or the same method can be employed with the lighted boxes used for demonstrating X-ray plates.

These diagrams are available at the mere cost of paper, printing and postage because the blocks may be secured from the office of the National Committee on Maternal Health. A space on each block has been left for printing the name of the hospital, service, or operator (or all of these) at the same time as the diagram.

BREAST TRACINGS

For mammary growths or edges of the glands, tracings on glass plates, as shown in Figure 49, furnish a record, life size, which one does not need to be an artist to produce. On a glass 8½ by 11 inches bound with passepartout tape a wax "skin pencil" outlines the nipple, breast and gland growth. The steps are as follows:

1. The pencil outlines on the skin any lumps or edges of glands.
2. The plate is placed at right angles to the nipple, resting against the hanging arm, or else the arm is raised. A deeply sagging breast may call for two tracings, one hanging down, one raised to get the nipple in the center of the circle.
3. A profile is taken showing sunken nipple or sagging breast.
4. The thin typewriter bond paper used for multiple carbons is sufficiently translucent for tracing from the outlines on the glass, particularly with a bright light behind it. Samples of such tracings are given in Figure 49.

MEASURING. In making and recording measurements, particularly in areas not readily seen, the use of a hand scale, as described at the end of the chapter on the Vagina will be found useful.

CHAPTER III

UTERUS AND OVARY AND TUBE

PRACTICAL *objectives—Dimensions of the uterus—Casts of uterine cavity—X-ray pictures of cavity—Size of cavity—Distortion in shadows of cavity—Shape of cavity: infantile forms; intrauterine mechanisms—Shape and action of cornua—Summary of cavity shapes—Sterilization by cautery—The tubal spindle and sphincter—Location of fundus—Shape of the cervical canal—Cervicitis—Thickness of uterine wall—Rhythmic uterine contractions—Cyclic changes in uterus and ovary—Earlier observations—Contractions in empty uterus—Uterine muscle arrangement*

(FIGURES 13 TO 49)

HERE, AS ELSEWHERE in this volume, attention is focussed on practical issues and on standards, on neglected matters and newer claims and developments. For example, the possibility of determining the date of ovulation from the character of the rhythm of uterine contractions is discussed at some length, because exact knowledge would fix the time to hope for, or to avoid, conception. Again, this pioneer analysis of the shape of the cavity bears on sterility, on the recent employment of intrauterine contraceptive devices, and on sterilization by attack at the upper angles of the cavity.

THE UTERUS

Two views of the female organs of reproduction are placed on the same page for ease of comparison (Fig. 13). In the upper picture the uterus is that of a woman who has borne children. This is close to 9 cm. long and 6.5 cm. wide (3½ x 2½ inches) (Figs. 22 and 23). In the margin the size of the uterus before pregnancy is shown, 7 cm. by 4.5 cm. (2¾ x 1¾ inches). In each case the cervix is 2.5 cm. (1 inch) in length. The median section below shows a virgin uterus over an intact hymen and an unstretched vagina—the latter a transverse slit with front and rear walls in contact, the front wall 6 cm., the rear 9 cm. in length (2⅜ and 3½ inches) as shown in Figure 51. Above, the vagina is distended, but even this does not depict the still wider distensibility of its upper part, outlined in Figures 62 and 63; nor its length when stretched out, as in Figures 57 and 60. Only one of the pair of vulvo-vaginal glands that provide vulvar lubrication for coitus is shown (Figs. 69; 72 and 76).

On one side tube and ovary hang as in life, whereas on the other they are deployed and cut in half lengthwise to correspond with the sectioned uterus. The tube is 14 cm. long (5½ inches) and its passage at the inner end the size of a bristle. The rarely pictured constriction near its fimbriated end (See Figs. 23; 45) is worthy of note, since we think of the tube as a trumpet whose interior expands along its full length, also because of the frequent closure that causes sterility (Fig. 172). At the abdominal end of the tube closure is produced by inflammatory adhesion of the fimbriae rolled inward; whereas at the uterine end of the tube the closure is chiefly by inflammatory swelling and tight apposition.

The cervical canal in Figure 15 points nearly at right angles to the vagina when bladder and rectum are empty (Fig. 50, angles AC, AV). The cervix of marked anteflexion (Figs. 13; 53:C) and that of nearly complete retroversion or retroflexion are to be noted as directed toward the vulva, that is, they both lie in the vaginal axis (Figs. 13; 51). The canal of coitus is at an acute angle to the uterine cavity as a whole as shown by AEU and AC in Figure 50.

There are considerable variations in size and shape of the uterus, and more particularly of its cavity. German and later American reports show larger average dimensions than those earlier French figures which have dominated the anatomies. This difference in standards is shown in Figure 22, where for contrast the variant uteri are placed alongside of each other. It will be noted that the French figures run one to one and a half centimeters, or half an inch, smaller, except for the cervix.

CASTS OF UTERINE CAVITY

Remarkable representations of the interior of the uterus were presented as casts by Guyon in 1858 and by Hagemann in 1873, the latter most astutely choosing excellent types for his lithographs (Fig. 28). Mauclaire used wax and his results are monotonous and defective (Fig. 32). Plaster with a metal wire core we find much too fragile. Guyon used the ordinary resinous mass employed to produce corrosion specimens and with success. Hagemann's results present such perfection of detail that his method is fully quoted:

"The injections were made twelve to twenty-four hours post mortem, using either a thin liquid metal composition or paraffin. 'Rose metal' showed itself impracticable because of its relatively high fusing point. Very good casts were made of a mixture of 15 parts bismuth, 8 parts lead, 4 parts tin and 3 parts cadmium which fuse at as low a temperature as 70° (C), the best process being as follows:

"The uterus to be cast is cleared by the injection of lukewarm water of the mucus adhering strongly to its cavity and particularly to the cervical canal. The remaining liquid is carefully sucked up by the syringe. Length of vagina should not exceed two to three centimeters owing to the difficulty of reaching the external os. The upper part of the vagina is placed round a ring corresponding in size to the lumen of the vagina and fastened to it by means of a number of stitches. The uterus and vagina are then hung on a movable frame and placed in water at 60° (C) yet so that the water level did not quite reach the ring. In order to protect the vagina and external os from drying they are covered by an evenly dampened cloth. The temperature of the water is kept as constant as possible, so that excessive heat shall not cause the muscles to coagulate and thus bring about a change in form; the uterus remains submerged from three quarters to one hour.

"In the meantime a syringe is heated by means of boiling water; the diameter of its nozzle is slightly smaller than that of the cervical canal. The metal which has been fused in a crucible is sucked into the syringe and then quickly injected into the suspended uterus. It is sufficient to place the nozzle in the cervical canal, it being impossible to go beyond the internal os. When the cavity of the uterus is full the metal is seen round the nozzle. Then the latter is slowly removed and the remainder of the vagina injected. The syringe used for this purpose and the nozzles of various sizes were made of brass, and it was easy to remove the remaining metal from them by boiling them in water.

"For the injection of the cavity of uteri with narrow cervical canal, it is better to use paraffin, as the latter takes longer to solidify than metal, the manipulation of which is difficult with narrow nozzles. In using paraffin the water bath is not necessary.

"After the mass has cooled, it is easy to remove vagina and uterus from the cast by knife or scissors. In the case of paraffin care must be taken not to break off the little protuberances nor fracture the junctions at vagina and internal os. This can be prevented by introducing before the paraffin cools and becomes very brittle, a slightly bent pin or piece of wire, its size gauged by the width of the cervical canal and the weight of the cast of the fundus it must carry later.

"The injection pressure was at the most 40 mm. of mercury for metal, less for paraffin."

X-RAY PICTURES OF CAVITY

Casts however have to be made of the dead uterus which limits the evidence to autopsy material or to removed organs. Meanwhile, for years, another fruitful source of information has been available in the thousands of X-ray silhouettes made of Fallopian tubes, filled or partially filled with an opaque fluid, in the course of diagnosis of sterility, tubal closure and tubal disease. But this material had never been collected and summarized for its bearing on the shape of the cavity of the uterus.

Accordingly, I undertook to search the field, and to make tracings of the best films, or their reproductions. The search covered the literature, and the records in a number of X-ray departments abroad (1926) and in this country, often gathered in personal visits. In this way hundreds of outlines were secured. Some of the notable examples discovered are the fine specimen films at Brooklyn Hospital; perfection in the large series, including many with pneumoperitoneum, of Stein and Arens at Michael Reese in Chicago; excellent clarity in Jarcho's series from Sydenham Hospital and in Kennedy's at the Woman's Hospital, in New York; and great variety in the extensive private collection of I. C. Rubin. Contractions are best shown by G. Schultze, Schneider and Eisler, and Jarcho (Figs. 30 to 33; 174; 175).

In 1930, Dr. Marynia F. Farnham and I grouped the forms of cavity and, after discarding those wherein distortion obscured interpretation or measurement, analysed 317 specimens. Any measurements quoted in the following statement, based on this analysis, take distortion fully into account.

SIZE OF CAVITY

In the anatomies and gynecologies the generally accepted figure for the length of the cavity of the fully developed virgin uterus is about 6.5 cm. (2½ inches). A search was made for any series of figures published during the time when, as a routine part of the pelvic examination, the uterus was probed with a sound bearing a graduated scale and a knob on its shank at 2½ inches, but no such table was discovered, although Mundé (1885, p. 96) gives fourteen pages to the general subject and Hart and Barbour say: "Measurements with this sound on the living are a little in excess of those obtained on cadavers."

The figures of the total *length* of the *cavity* of the *parous uterus* show a wide variation among books on anatomy, gynecology and obstetrics, the largest being 9.4 cm. (3¾ inches), as given by Tandler (1923, p. 273) (Fig. 22), and the smallest 5.7 cm. (2¼ inches) as given by Testut and Jacob, a difference of 3.7 cm. (1½ inches), the average of the findings in about 450 cases reported being 7.39 cm. (2⅞ inches).

The figures for the *nulliparous uterus* show the same wide disparity, the largest figure again being Tandler's 8.1 cm. (3⅛ inches) and the smallest being that given by Webster, 3.2 cm. (1¼ inches). Meaker writes me that he finds in 67 cases, mostly nulliparous, an average of 7.4 cm. for the total uterine cavity.

In round numbers this gives us *7.5 centimeters or 3 inches for* the *length* of the *cavity of the parous* and *6.3 centimeters or 2½ inches* for the *nulliparous* uterus, with a difference between the two of 1.2 centimeters or half an inch. The diagram in Figure 22 visualizes these data.

The average figure taken from 19 measurements given in the literature for the *outside* of the parous corpus uteri taken at its broadest point, is 5.1 cm. (2 inches) while for the nonparous uterus, the average breadth was 3.6 cm. (1½ inches), a difference of 1.5 cm.

DISTORTION IN SHADOWS OF CAVITY

There is considerable variation in the angle at which X-rays of pelvic contents are taken owing to various postures of the woman, or the placing of the film ventral or dorsal to the body. Authors, moreover, rarely specify how each plate was taken, nor which is the patient's right or left side.

If the uterus of the recumbent woman lies in the usual position when the picture is taken, the line of light may hit the top of the organ and run nearly lengthwise of the cavity of the corpus, whereas the ray strikes the cavity of the cervix at an obtuse angle (Fig. 33). This yields what might be called a toadstool shadow, a stalk below a curved cross-bar. However, it usually happens that backward displacement of the body and forward displacement of the cervix is caused by the bivalve speculum (Fig. 41) and by the rigid tube passed up through the internal os to inject the iodine oil mixture, so that the whole organ is retroverted by this process and it is seen from its anterior aspect, while at the same time the canal is straightened and the cavity only moderately foreshortened. Moreover, most pictures are taken from a point well forward of the axis of the inlet as shown by the flattened inlet and the closeness of the cervix to the shadow of the pubes (Figs. 174; 175).

In cases of retroversion we again observe distortion because the body is caught in a line of perspective running from the internal os toward the fundus, and another toadstool shadow results (Fig. 33). In cases of anteflexion the back of the cavity of the body is nearest the light, and the shadow of the filled corpus may lie across the shadow of the canal of the cervix making the figure of a cross with unequal bars. In films, the anteflexions are remarkable for their rarity, perhaps because distension of the uterus with fluid straightens out flexion, just as any active uterine contraction tends to do. In lateroversion, a lopsided combination of any of the above may occur, or a false impression of asymmetry when the corner nearest the light may give the appearance of being larger and longer than its fellow.

SHAPE OF CAVITY

The form shown in the film may, of course, be only one stage of filling or of contraction or relaxation (Fig. 30). In any event, wide variations in the shape of the cavity were apparent in studying the 317 cases in the Farnham-Dickinson series. Three general groups were discernible: *triangular*, *bowl shaped*, and *quadrilateral*, distributed as follows:

The *triangular* form or stage is definitely three sided in appearance with decided narrowing toward the cervix (Figs. 28 and 30). The triangle may be either relatively broad and short or long and narrow. These again may be differentiated as to their superior surfaces, which are usually domed or convex, less often flat, and most rarely, sagging or concave.

As shown in Figure 32, the great majority of the 317, or four in five, were *triangular*, about half of the broad short form, and over a third, long and narrow. Most of the broad triangles, 69 per cent, were found to have convex or domed tops, while 21 per cent had flat and 10 per cent concave or sagging. But the long narrow triangles had relatively more concave tops or 15 per cent, with 19 per cent flat and 66 per cent domed.

The *bowl* form found in 10 per cent, shows a distinctly rounded appearance in the lower segment of the body cavity, and a marked blunting of the cornual angles.

The *quadrilateral* form shows a very broad lower segment and consequently little taper toward the cervical canal. Only 8 per cent were squarish, or one in twelve.

Finally, in about 75 per cent there was a distinctly narrow internal os, and a broad one in only 25 per cent.

Infantile Forms. It is to be remembered that most of the X-rays were taken for sterility, that most of the sterility in this group is from closed tubes and that considerable non-pregnancy sterility may be due to infantilism. It is remarkable, therefore, to find so few infantile forms of corpus if the narrow-topped cavity of the Hagemann casts shown in Figure 28 is really infantile. There is a total of 23 instances. A few may be really no more than empty corpus cavity or cornua. How narrow a cavity must be to be classed as defective development I am not clear, as many of them fail to show an excessively long cervix, the total being only three. I should so class a number of Rubin's did not Testut and Jacob give the transverse of the virgin cavity as 27 mm. and of the parous uterus as 32 mm. Mauclaire's bifundal form may be due to his wax process (Fig. 32). His uteri are in post-mortem rigidity or insufficiently distended as shown by their straight sides. The dead uterus has a wall harder than the living, except at the height of contraction in the living.

This relative scarcity of defective corpus cavity, one in fourteen, is striking. In the Rubin series a long cervix with full development of cavity is common while a narrow fundus cavity is rather rare. Here there were 23, or 7 per cent. The frequency of a disproportionately long cervix, as showing infantile form, is stressed by Meaker in his measurements of 67 cavities in sterile women. In our series there were 30, or 9 per cent, with markedly long cervices.

Intrauterine Mechanisms. A new reason for exact knowledge concerning the forms of the uterine cavity lies in the extensive use of various intrauterine mechanisms to prevent conception. As a single example, it is reported that from 140,000 to 250,000 of the *Pust* stem (Fig. 165), itself but one of a dozen similar devices, were sold in a relatively short period.

Certain rigid and hollow forms of stem (Fig. 165) are credited with nearly a dozen deaths and the reported infections reach to near four hundred.

The newest German fashion is an intrauterine ring, or silver wire coiled spring circle of 1.5 to 3 cm. diameter, worn continuously, with few accidents. Gräfenberg (1931) who devised this ring in 1927, had placed 600 by September 1930; and before using silver had inserted 1100 circles of silkworm gut, some worn for years. Test curettings examined by Robert Meyer showed no harm.

These figures give an idea of the extent of the intrauterine invasion. The whole question of intrauterine devices was taken up in detail in our manual "Control of Conception" (pp. 101–117). There the 317 cases of X-ray shadows of the cavity were classified, according to their suitability for rings and it was found that a third were unsuited, of which the great majority had long narrow cavities, one in seven were of quadrilateral shape, while the remaining two-thirds were suited to rings so far as the cavity alone was concerned. Considering the cervix by itself, there were 75 per cent with a narrow internal os which would favor retention (Fig. 165).

However, since those notes were made, accumulated experience reported in Europe brings into question the earlier judgments on the general applicability, efficacy and harmlessness of the silver intrauterine ring while Gräfenberg's 1932 estimate is that only 25 per cent of uteri are adapted in every way for his rings.

SHAPE AND ACTION OF CORNUA

As seen from in front, the conventional form of cornu is the cone with a wide base and rather evenly tapering point, the sides usually a bit bowed outward. In this series there are 112, or 36 per cent, with a wide base, of which 70 agree with G. Schultze's "basic form," as shown in Figure 30. Other broad forms noted include the breast or bowl shape, the long breast shape cone, the squarish blunt cornu, the rounded, moderately pointed cone and the broad angle making up 27 per cent more. All these together amount to 63 per cent of all, or roughly two-thirds which are clearly broad, since the breast-like cupped or domed cornua cannot have been distorted by any angle of vision.

The appearance, however, of a long narrow point may be deceptive as it is due often to the angles of a cavity being seen from on top, and thus flattened from before backward; and again, some of the narrow shadows, shown from above may actually have been tapering cones. But this possibility explains only about half of the long narrow pictures, which together occurred in 74 instances, or in 23 per cent.

The *upturned cornu*, on both sides, aside from the bicornate uteri, is found 12 times, about 4 per cent, and sometimes on one side only. The Japanese molds from 8 uteri pictured by Nishizaki all show this upturned form (Fig. 32).

The bicornate uterus is rather rare, and not more than 3 marked cases in the 317 were found, to which may be added 6 others with a marked dip in the curve of the fundus, either a bifundal type, or else a localized contraction.

Asymmetry. In our series of 317 films we find a *lopsided* cavity in 45 cases, in 21 instances with one cornual angle wide and the other narrow, and 24 with one side domed and the other sharp. The asymmetry is very marked in 17, and is probably not often due to distortion in taking the pictures. The asymmetrical cavity, with an incidence of one in eight may mean that one side is contracting while the other is quiescent. The G. Schultze (p. 434), Schneider and Eisler, and Jarcho series graphically depict this action (Figs. 30 to 33). Tubes synchronize sometimes. The cornu may push out or draw in at the rate of 2 to 4 contractions a minute or one in 15 minutes.

SUMMARY OF CAVITY SHAPES

We thus find an extraordinary variety of form or activity in the uterine cavity, especially in its upper angles. The distribution of various type shapes of the body cavity and of cornua observed among the 317 films analysed is shown in the following list, where the figures are expressed in terms of the number of instances per hundred cases.

	Instances Per Hundred Cases
I. General shape of body cavity:	
A. Triangular, total	82
Broad (domed, six-tenths, sagging, one-tenth)	47
Narrow (domed, two-thirds, sagging, one-seventh)	35
B. Bowl shaped	10
C. Quadrilateral	8
II. Cornua:	
A. Symmetrical, total	86
1. Broad, total	63
a. Wide base, total	36
with narrowing cone	22
with very sharp point	9
with blunt cone	5
b Breast or bowl shape	8
c. Long breast shape cone	6
d. Blunt square	6
e. Rounded cone, moderate point	4
f. Broad angle	3
2. Narrow, total	23
a. Spindle or sphincter	11
b. Long pointed cone	8
c. Upturned cornua, pointed.	4
B. Asymmetrical, total	14
1. Sharp one side, breast shape, other	8
2. Sharp narrow, one side, wide other.	6
III. Unusual general forms·	
Bicornate 1; bifundal, 2	3
Long narrow body cavity	7
Long cervix	9

To summarize: symmetrical, triangular forms predominate. The *body cavity* is *generally triangular*, broad in about half, and narrow in about a third; one in ten is bowl shaped; and one in twelve quadrilateral The *cornua* are alike on both sides in six cases out of seven, and in more than three-quarters are broad based cones, triangles, or bowl or breast-shaped; with less than a quarter narrow spindles or long pointed cones. Asymmetry was noted in only one film in seven, whether due to actual difference in structure or to alternating contraction.

STERILIZATION BY CAUTERY

To close the uterine end of the tube by a stricture produced by a chemical or electrical burn, one works best on a pointed or relatively narrow cornu (Fig. 166). Without visualization by the use of the hysteroscope it is rarely feasible to locate the tip of an instrument within the tube-mouth in a bowl-shaped or rounded cone, whereas in a narrowing cone or a sharp angle the point catches and holds easily. The failures in my own cases have been chiefly where the uterine sound failed to outline a fairly good triangle at each cornu, and I had been unwilling to offer hope of success under such circumstances (R. L. D., 1916).

As the narrow angle seems more commonly found in the woman who has had no children, this burn with subsequent stricture, electrical or chemical, would seem adapted to those who should be prevented at the outset from propagating their kind, such as mental defectives.

Among the film cases just listed, there are 74 narrow forms, 27 with sharp points; and another 70 with narrowing cone; or with cornua suited to cautery treatment, possibly only three-fifths. It is probable, moreover, that just as the curette causes relaxation of the uterus and the sudden feel of a big flabby pocket (Figs. 33 and 171:B) so the local shock of the hot wire may turn a pointed cornual cavity into a bowl, and the tip no longer fits snugly the full circumference of the narrow angle which it is expected to cauterize deeply. This matter is discussed further in Chapter VIII.

TUBAL SPINDLE AND "SPHINCTER"

The transverse diameter of the spindle shaped cavity in the cornu or in the tube, was measured in films made on 30 patients, with a total of 35 measurements. This measurement had to be approximate because shadows were not life size. For the reproductions, the pictures were enlarged till the transverse of the inlet was of average diameter, and for films, the transverse reduced to average dimensions. The uterine diameters were either enlarged or reduced in the same proportion as the pelvic diameters, case for case. In the small number of cases where the inlet was missing the transverse diameter of the cavity was enlarged to its average transverse diameter, and the spindle enlarged on the same scale.

Thus estimated, the cross-diameter of the spindle averages below 2.5 mm.; one-half run below 2 mm., one-half above. Nearly one-third of the diameters are between 1 and 1.5 mm. The largest are the seven measuring between 4 and 5 mm. Thus the width ranges apparently from 1 to 5 mm. with an average above 2 mm. In length the spindle is not quite twice the breadth, or 4 mm. The tube in its passage through the outer uterine wall is 1 mm. in diameter and inflammation very rarely seals it, though swelling of the lining and kinks close the lumen and pyosalpinx and hydrosalpinx result. Some examples are given in Figures 33 and 172.

It will be seen that in over ten per cent of 317 shadows a definite spindle or sphincter was found. The better the X-ray, the more frequent the spindle, as in the Stein-Arens or Jarcho or Schultze series where they are nearly always present with patent tube. Elektorowicz saw it appear in 61 per cent of all cases.

Along the tube there are said to be nodes of circular contraction, with lengthwise contracting fibres causing longitudinal shortenings between these nodes. The frequency of beat of relaxation and contraction after removal and hanging in oxygenated Ringer solution is "three to five seconds." It varies during different parts of the menstrual cycle as shown in Figure 44. The chief period of activity for frequency of recurrence, height of wave and grouping in increasing, and then diminishing, strength of contraction, seems at the time the ovum is supposed to be present in the tube, according to the Seckinger and Snyder observations on tubes removed from the body (Fig. 42). Rubin's revolving drum has recorded many thousands of cases of rhythmic contraction and the average rhythm of contraction.

Beautiful casts of the spindle were published by Guyon in 1858 and by Hagemann in 1873, while Bayer depicted spindle and sphincter in 1908 (Fig. 28). The persistence after death in all these cases shows that this formation is no mere spasm or sphincter in action, but an anatomical conformation. The histological notes by Hélie are mentioned later, in connection with uterine contraction.

LOCATION OF THE FUNDUS

Since the report by His on two suicides, the fundus has been supposed to lie to the right, with the cervix pointing to the left of the center line. My analysis of films shows the top of the uterus a little to either side, indifferently right or left, and less often in the exact center. In 211 roentgenograms I find the middle of the fundus to the right in 40 per cent, to the left in 38 per cent and centered in 21 per cent. The antero-posterior midline of the pelvis crossed some part of the shadow of the distended cavity of the corpus in 77 per cent. These subjects were recumbent, with bivalve speculum in place; a large number were sterile and with closed tubes, and some had known or possible adhesions, and as adhesions or distended tubes might have displaced some uteri, this evidence is not free of pathology. Again, some uteri may have been displaced by the instruments used.

In five patients with mobile organs studied every two or three days for three months for uterine and ovarian cyclic changes, my bimanual palpation found the fundus rather indifferently right or left, with a small preponderance to the right (Fig. 40). The observations were made after bowel clearance. A note was taken whether these after-breakfast findings followed sleeping on one side or the other, but no correlation was found between the side slept on and the inclination of the organ. When introducing the bivalve speculum in gynecological practice the cervix is sometimes missed because it so often lies toward the left. I recall no external os to the right of the center line in mobile uteri.

SHAPE OF THE CERVICAL CANAL

Filling the uterus with an opaque fluid held within the cavity by a conical shoulder on the injecting nozzle is not calculated to make clear the contours of the cervical canal. Therefore we find only a certain proportion of the X-rays furnishing information on this subject; nor do we find much evidence about contraction or relaxation at the time the picture was taken. Among 257 available outlines the canal was narrow in 48 per cent, wide in 41 per cent; and with 9 per cent showing palmae plicatae. Three-quarters demonstrated a narrow (or contracted) internal os, one-quarter a wide (or relaxed) os, under this distension with fluid. We cannot in these X-rays distinguish the parous from the imparous uterus as we would like to do, in order to determine the effect of labor upon the internal os. The narrow triangular form of body is not always accompanied by a narrow cervical canal (Figs. 28 and 32). The infantile uterus would be supposed to have a long roomy cervix and internal os (Figs. 28 and 31). Some of the bowl-shaped cavities have singularly narrow cervical canals. The "quadrilaterals" usually show a wide internal os and wide cervical canal (Figs. 28 and 32).

Guyon and Hagemann in their beautiful models show wide variations (Fig. 28). These are post-mortem, therefore, free of alterations due to contraction, general or local. While the body cavities of Guyon's A and B are not unlike, cervical patterns are strikingly different. Hagemann's cervices are totally different although the body cavities are of the same general quadrilateral type. One figure shows a wide tear; another has the kind of internal os that might well block drainage if congested or which a moderate spasm might obstruct. The sound could enter the lower Guyon cavity with difficulty. Hagemann's moulds are the prize examples in all literature for detail. This work calls for extensive repetition.

The main varieties of cervix are given in Figure 29. The edematous cervix is faintly indicated as occasionally double the ordinary diameter, even without prolapse.

The appearance of the cervix, as seen in the speculum, is reproduced in great variety and perfection of form and color in Heitzmann's "Spiegelbilder der gesunden und kranken Vaginalportion und Vagina" a book far too little known and too seldom drawn upon for reproductions. Formerly the shades of red in its pictures rendered copying in black and white difficult, as they reproduced too dark, but the newer screen work makes the necessary allowances so that there is no excuse for poor pictures of the cervix and its disorders and injuries.

The internal os is usually given as 3 mm. (⅛ inch) in diameter for the virgin or nulliparous uterus. G. Schultze has shown it in spasm by roentgenograms (p. 439). The woman who has borne children may have an external os stretched and torn. The old writers declared it torn in half the cases, but we must await data from De Lee and Byron Goff. A degree of healing will have occurred.

Marie Stopes makes the claim that the point of the penis enters the external os. We count in the films 19 canals wide at the external os. Even this number gives only one in five capable of admitting the finger tip, let alone the broad glans penis. A rod four centimeters in diameter cannot enter a canal of four millimeters, or one-tenth that size, for the canal is unyielding (Fig. 140). Jayle calls the projection of cervix into the vagina 7 to 10 mm. in front at the anterior fornix, and 20 to 25 mm. behind at the posterior fornix. Poirier and Rieffel, quoting Henle in 1907, gave 5 to 7 mm. in front, 18 mm. behind; but the 1923 edition (p. 551), makes the anterior fornix 0.5 to 1.5 cm. and the posterior 3 to 5.5 cm. Waldeyer speaks of the posterior vaginal wall as a cushion supporting the cervix (Fig. 13).

Cervicitis. The cervicitis shown in Figures 29 and 34 is the most common pelvic disorder of women and possibly the most frequent cause of sterility and of the puerperal fever developing in women never examined during labor. The mucous membrane of the cervix is worthy of the elaborate microscopic study it has received. What is lacking, save for Heitzmann, is useful grouping of changes visible to the naked eye in the office and operating room, and also demonstration of blockade, from cysts high in the canal. The latter seem to be a rather common finding. Collections such as those of Winckel and C. C. Norris show the frequency with which the upper part of the canal is invaded; Beigel depicts three canals riddled with cysts; R. Meyer has an example; Bayer and also Christeller give high locations which shut off the passage in old women, while Clark and Norris, Litzenberg, Menge-Opitz and others picture them above malignant growths. I present sections of normal canals from Bayer, but only a diagram from Stieve, whose large color sections are of unsurpassed rendering.

THICKNESS OF UTERINE WALL

The anatomies give the figures 12 mm. for the fundus, and 15 mm. for lateral walls. But even in 17 films which I studied at Michael Reese Hospital in Chicago showing the uterus distended with iodine oil, and the peritoneum with air, there was a wide range in the various measurements, the averages differed from those usually given, as the top and side walls were less than half an inch thick, the front and rear walls more than half an inch in thickness. The details were as follows:

Fundus average 11 mm., ranging from 9 to 15.
Lateral walls, 12 mm., ranging from 9 to 18.
Anterior wall, 14 mm., ranging from 12 to 15.
Posterior wall, 14.5 mm., ranging from 12 to 18.

The total *thickness of corpus*, with walls in apposition, would average 3 cm. or 1¼ inches. This small number shows the live, moderately distended uterus (in sterility) with a fundus and lateral walls less thick than the anterior or posterior wall, the lateral walls a bit thinner than in the dead uterus of the anatomies.

RHYTHMIC UTERINE CONTRACTIONS

The uterus appears to me to develop special degrees and rhythms of contraction at the time of ovulation. The uterine changes are more readily palpated than those of the ovary. Relative quiescence follows menstruation, then activity develops during the time both ovaries are large and tender and while one shows protrusion; then distinctive quiescence recurs until just before menstruation.

Any procedure which would *date ovulation* in a given individual would help in the selection of times for desired conception, and safety from conception; and would determine whether the woman had a consistent "safe period." Such examinations would only be needed to find the time of active contractions, that is at the midperiod; and they are superfluous when ovulation is then indicated by pelvic ache, by ovarian tenderness or breast ache. Five patients were examined at two or three day intervals for three months, at the same time of day, with empty bowel, and yielded eighty-nine observations. In addition, some records of Mittelschmerz were examined, and my early publications were drawn upon. These data point to the following conclusions:

(1) The uterus in the non-pregnant exhibits steadily recurring rhythmic contractions and relaxations (Figs. 30, 31 and 40).

(2) The intervals range from two to twenty minutes as found by palpation.

(3) These contractions fall into three main periods, one of major activity at or about the time of ovarian enlargement, preceded and followed by periods of relative quiescence (Fig. 40).

(4) Before and during menstruation a minor increase in frequency and excitability may be found.

(5) In examining the uterus during ovulation, the findings suggest early pregnancy as do also the vacillations in the size and compressibility of various segments found while palpating.

(6) Both ovaries enlarge and become tender, and one may have a protruding mass; later the corresponding tube may swell (Fig. 40).

(7) During contraction any flexion (normal or otherwise) partially straightens out.

(8) Corpus and cervix may alternate in rhythm (Fig. 39).

(9) A wave of contraction may be found starting in the cervix, passing to the isthmus, and thence to the corpus. Except in isolated isthmus relaxation (Hegar's sign) the isthmus usually acts with the corpus.

(10) Ridges are found at times, longitudinal on the corpus, and also transverse,—either low on the corpus, or high on the cervix (Fig. 31).

(11) A firm nodule, usually asymmetric, may be detected in the body of the uterus, while a firm core is usual in the cervix (Figs. 31 and 39).

(12) Quick contraction, clear compressibilities, firm ridges, grooves, and definite nodules are much more frequent and more readily detected in early pregnancy than in the non-pregnant (Fig. 31). Definite relations between these rhythms and sexual excitability or orgasm, except for rather rare softening of the lower cervix, has not been noted, owing probably to lack of sufficient clinical opportunity.

(13) Palpation stimulates or shortens the rhythm under some conditions.

CYCLIC CHANGES IN UTERUS AND OVARY

The diagrams show what the finger feels in the way of alterations in diameter of the body of the uterus, and its consistency, also what calipers can crudely measure (Fig. 41). There seems to be more than one variety of alteration, as a contraction (hardening) usually increases antero-posterior diameters but may shorten them (Figs. 38 and 39).

The hardening uterus may straighten, the relaxed uterus flex (Figs. 38 and 39). This is sometimes so striking that it might explain the frequency of the slumped, flexed uterus in sections of cadavers shown in anatomies (Fig. 21). It also explains the surprisingly marked differences at pelvic examination in the same woman at different sessions, or between the record in the office and the finding in the operating room.

The ovaries in thin women may be readily palpable, especially the right ovary, which is usually lower and more accessible (Fig. 40). The rectum fills up the left half of the pelvic cavity and renders seizure of the left ovary difficult. Both ovaries swell and become tender to pressure at the midmonth, but one more so than the other, in six instances one being recorded as "twice the size of the opposite ovary." On the larger ovary a protruding mass may be found. A couple of days later, with lessened size and tension, a nodular feel like a "blackberry" has been noted.

One ovary may do more than its share, the left seeming to be the more active, both in palpated patients and from my Mittelschmerz reports. With mid-period pain both sides usually ache or are tender to the patient's pressure on the lower abdomen, but when asked to record the relative degree of tenderness or pain between one ovary and its fellow, several patients report alternation between one month and the next at times, with repeat at times. In one case pictured (Fig. 39) it will be seen that alternation in activity occurred, the left ovary being enlarged twice at the expected time, and the right responsible once, but three days late. Twice there was absence of palpable ovarian enlargement or tenderness, or possible absence of ovulation.

Tubal thickening and tenderness has been observed a few days after the supposed date of ovulation, on the side of the affected ovary, in four instances (Figs. 38, 39).

The patient seems to adhere to a given time in the cycle within three days, in the five palpated and in six mid-pain patients. In one case the findings of three periods (Fig. 39) pointed to the 13th, 14th and 17th day respectively; and one palpated patient showed uterine changes on the 9th day once, on 16th day once, and uncertain once.

EARLIER OBSERVATIONS

In 1864, Spiegelberg applied an induced electrical current to the body of the uterus of a twenty-four year old woman, fifteen minutes after execution by decapitation. He reported that the body of the uterus became paler and rounder, while it lifted itself away from the sacrum and became more upright; whereat the round ligaments rendered themselves tense and the broad ligaments, with the tubes and ovaries, drew nearer to the sides of the uterine body.

In 1886, J. Matthews Duncan, speaking before the Obstetrical Society of London, gave data on the frequency of uterine contractions as follows:

> "We know nothing positively or directly of the contractions of the healthy unimpregnated uterus, though the analogy of the lower animals leads us to believe that they regularly occur. . . .
>
> "The profession generally is made aware of the occurrence of uterine contractions, in an otherwise healthy unimpregnated organ, by their exciting the pains of spasmodic dysmenorrhea. . . . Such contractions are clonic and they vary in frequency, six in an hour being a common number; or they may be tonic, as judged by the pain having no interruption or very imperfect intermission. These painful uterine spasms

may be single and last for a part of a minute, or they may be numerous and recur for several, as for three, hours. . . . It is certain that regular contractions do take place in some, and probably in all, uteri containing fibroids. In a soft, embedded fibroid, of sufficient size, they can be distinctly felt, as in a pregnant uterus. They have been counted, occurring at the rate of from three to six in a minute. They cause changes in the uterine souffle if present. . . .

"Contraction in a uterus containing a fibroid is specially active during menstruation. It is then, that is, during menstruation, that a woman feels those dysmenorrheal pains which afflict those affected with a fibroid; and it is then that a fibroid is expelled from the uterus. Remarkable cases I have observed where, during successive menstruations, a fibroid was expelled into the cervix or into the vagina, and again withdrawn into the uterine cavity as menstruation ceases."

Lindblom, in 1891, reported on what he called "small material" in a "limited private practice" among patients upon whom "few notes" were taken, while doing the nearly daily massage of pelvic organs prevalent at the time of Brandt in Sweden. (See my report of 1892.) Lindblom explains that the finger was held motionless in the vagina in order to avoid excitement; or in virgins was passed into the rectum. This finger steadied the pelvic organs while the fingertips of the other hand stroked or lifted through the abdominal wall. He declares that definite alterations occurred in the uterus even during an ordinary examination, and that with some patients twenty or thirty repetitions verified the findings which he gives in great detail. They are abstracted as follows:

"The changes occur principally in the corpus, also in the upper cervix, and very little in the vaginal portion. At the start the body may be soft, relaxed and flattened so that a finger tip can be pressed more or less deeply into it. The upper cervix is equally soft, though usually firmer than the corpus, but in its lower part, particularly in the vaginal portion, quite firm. While hardening comes on slowly—not often quickly—the antero-posterior diameter increases and the posterior surface of the body bulges. Next, the anterior wall rounds itself out. It takes five to ten minutes for the corpus to become as hard as a potato as it assumes more and more of a ball shape. These dimensions do not permit of measurement. Whether the cross diameter enlarges cannot be determined but sometimes it seemed certain; in any case it does not shorten. The long diameter does seem to shorten. Later the upper cervix swells and grows firmer, but never becomes as hard as the body.

"This swelling, this 'turgor,' more easily and more quickly increases than diminishes. Twice, in different women, I have found the corpus so soft that I could palpate the tip of the finger of the inner hand through the tissues of the uterus, but in a few seconds the corpus hardened. The quickest change is in ten to twenty seconds. In one eighteen year old prolapse the contraction was complete in one-half minute.

"When the swelling subsides the shortest time of the cycle is usually 5 to 10 minutes, and in some no change at all is detected during the observation. Subsidence is hard to follow because palpation may start hardening again. Subsidence does not exactly reverse the process, since the earliest process is change in the corpus till it feels like a freshly removed fibroid; then size and consistency go off together, and finally flattening is to be found.

"Sensitiveness belongs only to the softened condition. Between different women the findings vary widely, and also in one individual at different examinations. In some the corpus only is affected, in some the cervix alone may thicken, seeming to be taken up partly into the corpus. The corpus can double in size [thickness?] and even triple in size.[!] The shape is not uniform but the globular form is rare in virgins.

"In younger women the changes start less easily and quickly than in older patients. Capacity for enlargement and degree of irritability bear no relation to each other, nor the rate of swelling to that of subsidence. These vacillations have often been found after senile involution as well as in the infantile uterus, though with lesser emphasis and they are less easy to induce under these circumstances.

"The most effective procedure is massage of a particular part of the cervix; shoving the cervix far back and producing anteversion may also be productive of the alterations. Massage of a particular part of the organ does not induce action in that part alone, nor does massage of the parametrium or ovaries produce the effect, but the intrauterine sound does. In the puerperium, say on the seventh day, the effect can be produced on the flat wide organ, with doubling in size (thickness?)."

Lindblom is confident the process is no mere muscular activity and he avoids the term contraction because he declares this involves shortening, but believes the enlargement has a likeness to erection in a cavernous structure, due to increase of quantity of blood and heightened blood pressure. He is sure no element of erotic feeling plays any part. The ovaries are rarely found to be affected; there are no reports on the mid-period and no note of cycles save for the premenstrual uterine enlargement and menstrual shrinkage.

The experiments of Heinricius (1889) were carried on as follows:

"The woman lay on her side; a hollow silver uterine sound carried a small balloon of rubber condom into the uterine cavity; the sound had two outlets, one for filling the balloon with water, the other connected with a recording manometer. Three varieties of oscillation were recorded, short curves corresponding to the heart beats, ampler curves from respiratory movements, and longer curves showing contraction and relaxation of uterine wall. Some records show uterine contractions solely. The arterial pulsations are specially noted if the balloon bears on a large uterine artery; the respiratory curves are more neatly drawn in cases of relaxed uterine wall, while during the more intense uterine contractions the respiratory curves are less accented or disappear.

"The curves provoked by uterine contraction are not alike in all cases, on the contrary, they offer rather considerable differences. At times rising little above the level, at times they reach a remarkable height, rising to 40 mm. (on the water column of the manometer, which is about 12 times the mercury record). Usually the uterus fails to contract suddenly and violently as in labor; usually the contraction comes on slowly till it arrives at the culminating point, and then having lasted some time, it slowly lessens. However, in most instances the descending line (relaxation) seems shorter than the ascending line (contraction). In the same way a rather marked difference exists between contractions in the matter of their duration; at one time the entire contraction requires some minutes, up to three, again the contractions are produced and follow more quickly, one to two a minute. If, in certain cases, the curves compared with each other offer differing aspects, it is worth noting that in each case the curves keep a special type for that individual."

As to whether these contractions of the empty uterus depend on a quality belonging to the organ in the way of rhythm contraction, or are provoked by the irritation produced by the balloon, Heinricius declines to pronounce.

Acconci, in 1891, reports on experiments in recording uterine contractions on a Marey drum by means of a slender silver catheter armed with a small rubber bladder similar to the Tarnier dilator, with water transmission. He says that in his four women, who were at least a year past delivery, "the empty uterus is the seat of irregular, slight contractions which are repeated rather often," but with no period of absolute quiet. They are painless. The undulations occur seven or eight times to the minute, so he says they are not pulse beat or respiration. He illustrates by one record, on page 514.

CONTRACTION IN EMPTY UTERUS

In 1893, I wrote that my experience with pelvic massage had taught me that the empty uterus had the same habit of intermittent contraction I had described for early pregnancy (Fig. 31). In 1901 furrows and protuberances on the non-pregnant uterus were described with numerous drawings (Fig. 31). Unequal lobes had been more frequently seen than symmetrical divisions in forty-four cases, the lobes being separated by a shallow half-inch groove which rarely ran up over the fundus, and never below the isthmus. In retroverted uteri these had been found on the back.

That the ridges were not utero-vesical or sacro-uterine ligaments was demonstrated when the other hand slid the uterus from side to side over two stationary finger tips within the vagina and the ridges held to the uterus. In anteflexion of any degree a crease across the junction of body and cervix was found at times. In twelve cases the overhanging globular elastic upper segment stood on a firmer long column, and this was associated with vulvar hypertrophy, and a degree of cervical interstitial metritis (Fig. 31).

I went into detail concerning the symmetrical contractions in the presence of even consistency throughout the organ, and subdivided these as follows:

(1) *Extreme relaxation*, so that opposing fingers are felt through an empty bag, in a squat body with vague outlines, a rare condition, seen only in seven instances (Figs. 31 and 39). (2) *Relaxation*, with baggy walls seeming to pit under pressure, with lateral outlines fairly developed, not infrequent in the records. (3) *Partial contraction*, moderately resilient and elastic, with body rounded and outlines definite, fairly frequently noted. (4) *Contraction*, a corpus firm and resisting throughout, well arched behind and at the fundus, tapering laterally to clear-cut outlines. The common finding is shown in Figure 38, with round ligaments and inner end of tubes rigid and palpable in some well developed cases. (5) *Rigid contraction*, body hard as cervix and continuous with it; globular, thick antero-posteriorly, protruding front and back; frequently found (Fig. 38).

The *asymmetrical contractions* were also taken up in some detail, particularly where there was difference in consistency or resistance in different portions, in body, cornu or lower segment. Creases or localized contractions or relaxations were usually found to recur at the same spot at subsequent visits, but might wander. All these changes were found alike in the parous, the imparous and in virgins, and at any age. They accompanied a variety of pathological conditions, the most common being cervicitis; while in a small number, hypertrophy of the supravaginal cervix and little fibroids were associated with them.

Since making the recent study of five cases, I find a statement by Rouget (1858) that at ovulation the uterus enlarges, but less than at menstruation, the enlargement being in thickness rather than in width; and he compared the uterus before and after post-mortem injection, stating that complete filling of the blood vessels more than doubles the size of the organ. Thus one might explain an enlarged but soft corpus as one distended with blood, while a shrinking, hardening globular corpus is one whose increased antero-posterior diameter is due to muscular contraction.

The two periods of activity of the uterine muscle, the minor about the time of menstruation and the major at ovulation, with the two intervening periods of quiescence, correspond somewhat to the periodicity of activity in the tubes, shown among others, by Seckinger and Snyder (Figs. 42; 44). They picture, for freshly removed human tubes, three slight contractions per minute in the postmenstrual and premenstrual week. During menstruation the amplitude of the wave markedly increased. From the tenth to the sixteenth day amplitude and rate increased, and (after ovulation) from the sixteenth to the twenty-second day maximum amplitude and rate are recorded, five to eight waves per minute varying step-wise from very short to very long sweeps.

UTERINE MUSCLE ARRANGEMENT

Histological studies may explain the clinical findings. Hélie in 1864 defines three layers of uterine muscle, but says these are not clearly separable one from another; after delivery the outer layer takes up one-third of the wall, making a broad bundle slung from the center downward, deeper in the rear than in front.

As shown in Figure 37 the fibres are mostly transverse with many interlacings. From the round ligament broad bands spread over the corpus. It is a kind of muscle-drapery cut off at the lower uterine segment. Thus the corpus has a muscle-cap which reaches down to the peritoneal insertion. Fibres run into the utero-sacral ligaments and even onto the bladder and down to the cervix.

Inside the uterus is found a triangular arrangement with its base running from one cornu to the other, and its point at the internal os. The tubal openings are closed by rings of muscle which have been, says Hélie, already described by others as sphincters and he pictures spiral turns around the uterine openings of the tubes (Fig. 37).

Bayer, in drawing attention to lower animals like the mouse, with the uterine muscle in two clear cut layers, the inner circular, the outer longitudinal, says that this is the foundation of the structure in the human foetus. In foetal development this outer layer forms later than the inner and includes fibres continuous with and derived from the round ligament, the ovarian and sacro-uterine ligaments and the vagina. To these are added commissure fibres in an extremely complicated structure.

Bayer differentiates two distinct types found in childhood, one well developed with comparatively thick body and short cervix with well formed round ligaments (Figs. 16; 25; 36), and an atrophic type with short thick body and long cervix. At puberty all layers grow remarkably, particularly the outer, but the two types often carry over. In childhood the muscular walls of the uterus are one-third muscular and two-thirds fibrous tissue, but during active sex life these proportions are reversed to return after the menopause to the earlier proportion. (In type of muscle structure Werth and Grusdew insist that the corpus belongs with the tube, the cervix with the vagina.)

The careful diagram of superimposed layers by Bayer is copied in Figure 37, as well as moderate simplification of the unrivalled plates drawn by him from complete sections of the entire uterus. The intermediate vessel layer shows well in the transverse section. The diagonal fibres running down on to the vagina are noteworthy. Also the fibres in the utero-sacral ligament, nowhere else shown so well. Testut gives good sections of utero-sacral and round ligaments (Fig. 22).

Alternation of contraction as between body and cervix might be explained by the statement of Fellner, in 1906, that "the nervi erigentes are the motor nerves for the longitudinal musculature of the uterus and the inhibitory nerves for the circular musculature of the corpus and for the longitudinal musculature of the cervix, while the hypogastric is the motor nerve for the circular muscle fibres and the inhibitory nerve for the longitudinal fibres. In both cases there is seen the law of crossed innervation." I shall refer later to his belief that alternating action can produce insuck of semen.

CHAPTER IV

THE VAGINA

Difference *between live and post-mortem states—Shape and axis—Contrast between two parts—Rhythmic contractions—Dimensions and distensibilities—Records left by coitus—Hand scale for measurements.*

(Figures 50 to 69)

Let us differentiate, in vaginas, the quick from the dead. The pelvic floor, pictured post mortem, will show a gaping anus wide enough to admit finger or thumb if not closed by stitches before the section is made or unless the gaping was corrected when making the drawing. See Figure 53:D and I. It is fair to infer that some other distortions are present besides those of the floor muscles. The whole floor sags, the uterus droops, the vaginal curvature alters. Several postpartum uteri looked slumped on the pelvic floor, in an anteflexion like that of a seated man slid down on the small of his back (Fig. 53:C) so that we cannot say whether the marked angle between cervix and body was present before death or no. Even so post-mortem anteflexion is not frequent (Figs. 21; 24).

Again the fundus may have toppled over backward, as in Figures 53:F, 21 and 24, and we must guess by its bulk and the vaginal shortening whether or no this was its habit in life. Flexion of a mild degree, a hinge at the top of the cervix, is normal, because the corpus has rather slender side stays and forward guy ropes running out to the pelvic walls. These are laterally, the upper part of the broad ligament, and outward-forward, the round ligament (Fig. 16). In contrast to the body's capacity for toppling about, the cervix is stable, being compassed round about with quite massive connective tissue in the base of the broad ligament (Fig. 19); and it is, moreover, stayed by peritoneal sheets and foldings, like the uterosacral rearward layers and the vesical forward folds (Fig. 16). Naturally, the direction in which the cervix points or sags has much to do with the conformation of the upper part of the vaginal canal.

The vaginal passage itself is a pocket irregular in shape, rather than a cylindrical tube. It is about 7.5 cm. or 3 inches long, shorter on its front wall and longer on the rear (Fig. 50). It is collapsed to form a slit crosswise of the body (Fig. 55:F). Distended, it forms a gourd-shaped or pear-shaped balloon, wider at the top, and possibly lopsided because of the greater size of one lateral pocket or fornix (Figs. 62; 63).

The anterior wall is conveniently remembered as 6 cm. or 2½ inches, the posterior as 9 cm. or 3½ inches. The greatest lengths of posterior wall measured from the hymen are cited by Commandeur as 13 cm.; by Jayle as 11.5 cm.; by Charpy 14 to 15 cm. I have drawn attention to 13.5 cm. as the maximum measurement from suprapubic arch to sacrum, and 12.5 cm. from hymen to sacrum.

The width at the upper end is said by Rieffel to be 3 to 4 cm. in the nullipara and 6 to 7 cm. in the parous woman. Jayle calls the circumference 20 cm. We note that the lateral wall may be displaced clear to each pelvic wall, that is to a width of 11 cm. at least (Fig. 149:D).

AXIS OF VAGINA

In the vagina of the living woman with developed pelvic floor muscles, and particularly in one who has borne no children there is a pronounced curve—what one might call the curve of an italic letter "*f*" or "*S*" (Fig. 51). The general line is at right angles to the axis of the inlet, say 30° from the horizontal with the woman on her back. The lower two-fifths and the pre-cervical two-fifths lie at 55° and 10° respectively, that is, with 45° difference (Fig. 51). While this curve is mainly due to fascia held by muscles exhibiting a certain degree of tension, like the anal-sphincter-levator combination, the curve does not disappear altogether after death, as shown in Figure 52, which gives the post-mortem range found in 19 sections with apparently undamaged structures. There is a tendency to fall into two groups, the larger shown in the upper set, the lesser below, but the general trend is rather strikingly similar. Along any given line the lowest dot is at the top of the posterior fornix, the other at the anterior end of the vagina.

The outlines assembled in Figure 53 show variations between the average passage and some canals shortened by anteflexion, retroversion, tumor and removal of the uterus. The contrast in corrugation between virgin and parous is shown in Figure 94. A short vagina of retroversion that causes discomfort in coitus is to be corrected by a pessary. Several references to vaginal conditions are to be found in the chapters on the Pelvis, the Vulva and Coitus.

CONTRAST BETWEEN TWO PARTS

The upper and lower halves of the vagina present striking differences in environment—differences important to our studies. The lower vagina with a pelvic floor relatively undamaged by delivery, and never relaxed by sexual excesses, is surrounded and held by a girdle of strong muscles and fascia (Figs. 134 to 137). The introitus (Fig. 59) stretches in the virgin to one full finger, a diameter of 2.5 cm. (1 inch); in the married woman without children it readily allows the passage of two of the examiner's fingers (4.5 cm. or 1¾ inches); and in the woman who has borne children it has gone back from the size necessary for the passage of the head, namely a diameter of 9.5 cm. (3¾ inches) to three fingers, or full 5.5 cm. (2 inches) when distended. (See Hand Scale of Measurements, at the end of this chapter, and Figures 58; 59; 73; 100.)

The upper half of the vagina, on the other hand, is a collapsed elastic bag. In front hangs the base of the soft-walled bladder with a certain range of motion upward. In the rear lies a thin recto-vaginal partition and a thinner vagino-peritoneal partition, displaceable clear to the sacrum (Fig. 57). Laterally the vaginal wall can be pushed outward to the muscle layers cushioning the upright sides of the bony basin, the pelvis

(Fig. 149:D). The muscular fibres in the vaginal wall are considered with the uterine musculature (Figs. 15; 37:C

Bayer says that the front and rear walls each carry a broad, longitudinal band of muscle on the outside, with diagonal fibres coursing into the inner circular layer. The side walls are said also to show some longitudinal outer fibres that start in back and run upward and forward, but they come mainly above in diagonals from the cervix (Fig. 37).

RHYTHMIC VAGINAL CONTRACTIONS

Spontaneous rhythmic vaginal contractions occur every eight to ten minutes in the child-bearing period; they originate in the cervical end of the vagina and pass downward to the introitus, the rate being the same in different parts with the amplitude less on the lower segment. Contractions originate either in the vagina or the uterus and cannot be induced by stimulating adjacent organs. Pituitrin and ergotoxin administered hypodermically cause immediate increase in rate and amplitude, but slight change in form. The contractions are more marked during the post-menstrual week. No similar contractions occur in the rectum. In women past the menopause, the rhythmic contractions are absent.

These data were obtained by Templeton, Stein and Schochet. They tested seven women by placing in the vagina a thin three story balloon, connected with a recording instrument, for quiet periods of two to four hours, at two or three day intervals throughout the menstrual cycle.

The authors suggest that vaginal contractions may have an influence on frigidity and vaginismus, but I consider this unlikely since the action is too feeble, being so slight as not to be appreciable to the examining finger.

VAGINAL DIMENSIONS AND DISTENSIBILITIES

The most nearly complete data on size and shape of the passage can be obtained by casts in the living or dead. Either plaster or sprayed paraffin has been used in my office or operating room with the patient in the dorsal or the knee-chest posture; such trials were begun many years ago. In the autopsy room a new series of casts have been undertaken for us.

My simplest method is measurement by a *test tube* of about the size of the erect penis as shown in Figure 56. This is passed in various directions, with the patient on the back, or better still, in the knee-chest posture. Notes are taken at once on the depth of penetration and the angle at which the tube lies. Or, as shown below, the same observations may be made in a two finger examination, as the fingers are nearly the same diameter as phallus or tube. The tube has a great advantage as the beam of the headlight entering it reveals what the relation of the glans penis would be to the cervix and external os when the glans passed in at various depths and angles. It will also show whether the meatus is caught against the sharp lower edge of the subpubic ligament, as is the case in certain instances of painful intercourse (Fig. 91). My diagrams of the vagina cover about 140 cases. For such purpose the closed glass tube is better than the bivalve speculum or even than the tubular open-ended German speculum.

Where an individual tenders evidence essential to knowledge of the behavior of the external os in orgasm, she can herself employ this dummy phallus, and the observer can see whether the cervix opens and shuts and mucus is extruded and drawn back.

The vagina of pregnancy appears to be generally short. Of twelve cadavers in section in Figure 52, only one shows the depth of the non-pregnant normal dimensions, indicated by the dotted lines. The thickened pelvic floor carries the introitus further out and away from the subpubic arch (Fig. 64) and this shortening is found in early as well as late pregnancy.

DISTENTION IN DOUCHING

Kristeller (p. 325) ran water into the vagina under "moderate" pressure with the patient on the back, and found "from one to 87 grams" retained, that is, up to three ounces. The patients averaged twenty-eight years; and multiparous women averaging thirty-five, with 4.6 children, showed a capacity from "one to 30 grams" with an average of 3.3 (a teaspoonful) or less than the nulliparous. My own pictured distensions are of larger content, being partly from casts made at pressures as great as can be borne without distress, and made with the vulva held tight, in order to show shapes of ballooned walls. Quantity was not measured.

There is no ballooning of the vagina when a douche is taken sitting up, unless the introitus is closed by strong muscles, or a conical shield on the nozzle blocks return fluid. Without such closure, even when lying down, the tiny folds or rugae may not be opened up, but the fluid merely leak out along the nozzle, as shown in Figure 54:A. The fingers can effectively close the vulva around the base of the nozzle and so permit full distension, then let go for the outgush, then resume the closure (Fig. 54:B).

With such precautions, the sitting posture is as effective as lying for cleansing but not for long application of heat in cases of inflammation.

For using the douche for contraception, as important as the instant use of the method is distension, in order to reach and cleanse each crevice. Failures to protect by the douche may have been in no small part due to failure to distend promptly and flush out suddenly by this method.

The bulb form of douche is provided with an adjustable and effective cone or shield for distension of the vagina (Fig. 54:C). Indeed it may be too effective. To seize the bulb with the whole hand and to squeeze with the full strength of grasp, while closing the vulva firmly with the cone, can readily produce inside the vagina a pressure equivalent to a column of 200 mm. of mercury, and with this pressure, the possibility of driving fluid through uterus and tube into the peritoneal cavity (Fig. 54:D). One finger and a thumb cannot exert excessive pressure. The 60 mm. thus possible is the average resistance to passage from uterus through normal tubes; while the douche water has the portal of the internal os to reckon with in addition. To keep below a 60 mm. mercury pressure when using the fountain syringe means to so hang the bag that the top of the water is about two feet above the nozzle. However it is only with a douche nozzle with a single opening at the extreme tip, and the tip entering the external os of a retroverted uterus that there is danger of injecting the uterine cavity directly.

VAGINAL RECORDS LEFT BY COITUS

The evidence concerning vigorous prolonged and oft repeated frictions or thrustings, upon or along the vaginal walls, falls into three classes: character of surface, distensibilities, and musculo-fascial tone. As an example of the vagina intacta, observe in Figures 53:B, 60 and 92:A the fine rugae and the lines of the sectioned canal. Compare Figure 92:C with Figure 94:D. As to distension, note the change in distensibility in case S778, Figure 60, before and after marriage, and the virginal vagina shown in Figure 61, cases S773 and S70. Note in Figure 57 the condition found where the couples enjoy very vigorous coitus in a variety of positions. In Figure 57, case S595, the largest vagina in my records, daily coitus had ironed out the hymen and polished the vagina and given it a maximum distensibility, but without loss of tone. The introitus closes to normal size immediately after the whole hand save the thumb, has been passed into this cavern and withdrawn (Figs. 58; 100). The lateral pocket, or the laterally distended form, is most often found with retroversion; and in the absence of a forward pointing cervix, one can infer from such a pocket that coitus takes place on the side or with his thighs across that thigh of hers which is on the opposite side from the pocket (Fig. 149:D).

In addition to posture and vigor, evidence of size of phallus and hardness of erection is presented. One measures not the vagina alone, but the total length of the coital canal, the outer part of which is made up of the funnel of entry, the vulva (Figs. 92; 93; 94). As shown by the test tube (Fig. 56) or by the later diagrams illustrating coitus, a full six inch length of penis carries the glans almost or quite to the sacral hollow and the bone is cushioned only by the posterior vaginal and the two rectal walls (Fig. 142). This bony wall may constitute a valuable support and protection against laceration, only 77 cases of tears high up in the vagina being found in the literature.

Further evidence is given in Figure 61 where the fat deposits in the buttocks and vulvar regions of this 240 pound patient prevent deep penetration. The first impression from the short vagina of case S614 was of a record left by an impotent or abbreviated organ until one measured from labia majora to posterior fornix, when the normal average of a six inch canal was seen.

Vigorous coitus does not necessarily smooth and polish the vaginal walls, for, with excellent tone of the submucous muscular layer, the rugae may remain prominent (Fig. 93:D).

Pictures and text concerning the muscles and fascia of the pelvic floor are found preceding the consideration of painful coitus in Figures 133 to 139.

The accompanying hand scale is given for convenience in making measurements (See Figures 56; 59).

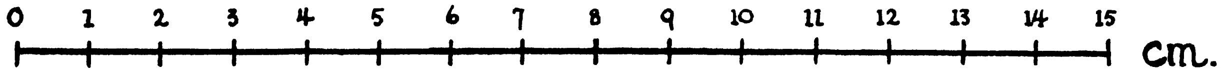
HAND SCALE OF MEASUREMENTS IN PELVIC ANATOMY

(See Figures 56 and 59)

Sample by and for a single individual and found to be as practical as the Kelly calibrator, or metal cone with scale, and handier

Each examiner should determine his own measurements.

	Diameter	
Distensibility of hymen or introitus:	*Centimeters*	*Inches*
One finger, one joint (index, first phalanx)	1.5	5/8
One finger (index completely passed in to base)	2.5	1
Two fingers, two joints (to third phalanx)	3·5	1 3/8
Two fingers (index and second completely in) *or* Three fingers, two joints (coned, to third phalanx)	4·0	1 5/8
Three fingers to knuckle *or* Four fingers, two joints (coned, to third phalanx)	4·5	1 3/4
Three fingers (completely passed in) *or* Four fingers to knuckles	5·5	2 1/4
Whole hand except thumb	7·5	3
Whole hand	8.0	3 1/4
Fist, closed	9·0	3 1/2
Across fingers:		
One finger	1.5	5/8
Two fingers	3.0	1 1/4
Distances inward, taken from sub-pubic arch:	*Length*	
Index finger, one joint	2.5	1
Index finger, two joints	5.0	2
Index finger, three joints	10.0	4
Index and middle finger together to knuckle of index	12.5	5
Index and middle finger together to base of thumb	15.0	6



CHAPTER V

THE VULVA AND BREAST

COMMON NEGLECT *of healthy vulva—Anatomical records of sex experience—Average dimensions—Location of vulva—Funnel of entry—The worn hymen—Coital and other changes—Male and female homologies—The clitoris: size, absence, location—Erection and erectility—Vulvo-vaginal changes in excitement; active, chronic—Vulvo-vaginal secretion—Congestion—Varicosities—Clitoris erection; vessels during erection; excursion; progressive enlargement—Vulvar hypertrophies: mechanism of hypertrophy, frequency, classification, development—Changes in labia minora proper—Minute anatomy—Follicles—Changes in prepuce—Accessory labia—Changes in fourchette and perineum—Changes in hymen—Meatus and urethra—Size of urethra—Pelvic floor muscles—Changes in vagina—Effect on uterus—Vulvar hypertrophy and labor injury—Breast changes in eroticism—Summary of erotic changes—Vulvas of prostitutes—Autosexuality: frequency; comparative reports.*

(FIGURES 70 TO 104)

ANATOMISTS as well as gynecologists and obstetricians in their writings commonly neglect the healthy vulva in matters of detail and variety of form and adequate picturing. There is no considerable collection of its anatomies save in a museum of law. Even then, of the two hundred and more remarkable specimens preserved in glass in the medico-legal institute in Vienna (where they are in danger of loss by fire) less than forty have been published by Hofmann and Haberda, and even these are somewhat altered by preservatives, and are pictured without indication of scale.

There has been no attempt at an adequate morphology of the region, with one exception and this is in a much neglected volume. To Jayle we owe a large debt for his extensive, varied and lucid drawings and text, but when I begged him to carry the work further he declared other investigations were more engrossing to him. The imperfection of this part of Jayle's classic is his failure to state the scale, and since there is evidence that some of the illustrations are larger and some smaller than nature, measurement and comparison are handicapped. Jayle's "Gynécologie: l'Anatomie Morphologique de la Femme" should be included in every reference collection or well equipped gynecological library.

Let us permit ourselves a comparison.

When one speaks of a "face" he refers to a complete set of features. But so wide are the variants between forms and colorings and markings, between babe and grandsire, between damsel and pugilist, between Negro and Nordic, that it takes many a group of facial types to furnish the concept or to define the form itself. Now there is an extraordinary variety in the features—and in the fashion of assembling thereof—in what the 1755 Chamberlen translation of Mauriceau calls "the Humane Parts destined to Generation;" and the French author thought it "not amiss to premise a Description so exact, of Every Part," that it, "joined with the Figures, will sufficiently inform."

Such "exact" information is here submitted by samples drawn from thousands of drawings and measurements in my case records. Many of the figures are reproduced directly from my sketches cut out of case histories, which were made on the spot, frequently in color. Even the loss of tint in these reproductions, however, does not destroy the impression of reality, such as can be conveyed with difficulty from a sketch to a newly constructed drawing, however carefully the latter is based on exact measurements, or careful copying. The patchy look of the pages may be forgiven in view of their "straight from life" character.

ANATOMICAL RECORDS OF SEX EXPERIENCE

Investigations of the many aspects of any subject must precede generalization. To the female "humane parts" medical science has given elaborate attention, noting their form and structure in disease, injury and deformity, but has passed by or avoided other variations and alterations quite as momentous to diagnosis and treatment.

Yet these are worthy of full study, especially if physical sex experience is locally recorded to any considerable degree. This, I believe, I can show to be the case and, by setting local anatomical findings alongside the patient's story, demonstrate that one can reach conclusions adequate as a basis for wise counsel. For this counsel, which must attempt to meet each individual's very individual need, every fragment of evidence is desirable because, with our present reticences, the advice calls for an amount of sagacity beside which the most complicated surgery is mere stitchery. I speak from extensive experience in both fields.

When one asserts that physical act is registered in anatomical alteration, he should qualify the sweeping statement. The bigness of a man's muscles may be endowment or development, or both. It may not be easy to determine which is the original factor, or which predominates; but with experience one usually becomes able to make a fairly correct decision. So with the hymen or the vulva. If one states he has observed no hymen freely admitting two fingers that has not eventually yielded a history of stretching, provided there was sufficient opportunity for inquiry, this is merely recording the results of one specialist's study. One can hardly retain a claim to the scientific attitude, however, if he asserts flatly that no woman whatever can possess a hymen easily stretchable to a diameter of two inches, insensitive and roundedged, without having had it expanded by douches, treatment, speculum, or coitus, or massage by herself or others. One merely puts his clinical experience on record, then others are urged to collect data.

AVERAGE DIMENSIONS

Before taking up the groupings into which the various forms of external genitalia seem naturally to fall, an attempt is made to depict an average shape with average measurements. This one might call a *basic* form to which the others can conveniently be referred without any claim that it constitutes the *normal* anatomy of the parts. Thus there are offered in Figures 70, 71 and 72, sketches of the vulva before and after separation of the labia, together with a diagram (Fig. 73) carrying the measurements collated from various textbooks as well as from my own studies of distensibility. This is accompanied by a chart on which to record graphically an operation for carcinoma, and a check on the actual glandular removal (Fig. 74).

MALE AND FEMALE HOMOLOGIES

The general homology between the male and female genitalia is too well known to need more than brief summary here. The labia majora correspond to the scrotum, and the labia minora to the prepuce, at their anterior union forming the prepuce of the clitoris.

The clitoris is the most obvious of the homologous structures and repeats in reduced size and modified form the chief component parts of the male, including the cavernous structures terminating in the glans joined in front and starting from crura attached to the pubic arch, and the corpus spongiosum is represented by the bulbs of the vestibule (Figs. 75; 76; 110; 138).

The female organ is minute compared with the male organ, but the size of its nerves and the number of nerve endings in the glans of the clitoris compare strikingly with the same provision for the male. Indeed, Kobelt (p. 39) states that the glans of the clitoris is demonstrably richer in nerves than the male glans, for the two stems of the dorsalis clitoridis are relatively three to four times as large as the equivalent nerves of the penis. Without dividing up, they run mostly with three branches to the edge of the glans (Fig. 75:C). Here, before their entry, they are so thick one can hardly comprehend how such a volume of nerve tissue can find room between the numberless blood-vessels of the tiny glans. Arrived near the surface of the glans they dispose themselves, just as in the male glans, in an intricate plexus, running also in loops into the tender membrane of the prepuce.

The intersex copulator is pictured in detail from original case histories (perhaps for the first time, life size) in the chapter on the male (Figs. 117; 118; 119) because these intermediary forms throw light on various homologies.

Hair on Mons. The distribution of hair on the mons usually differs in man and woman, being roughly rhomboidal and extending well up toward the navel in the man, while it is more definitely triangular with the base at the top in the woman. The narrow triangle is more common than the broad in the few notes found, that is, in the proportion of five to four. Thick hair was more common than sparse, with absence in one instance. The extension upward toward the navel and down the inner front of the thigh occurs in individuals with other masculine traits (Fig. 80). Jayle gives careful drawings of variety, and H. C. Coe has studied the forms of shield.

LOCATION OF VULVA

It is generally stated that the location of the external genitals of women varies considerably and that the vulva may be placed forward or to the rear, with facility or difficulty in intercourse as a natural consequence. It is often asserted that such variants are racial traits, the rearward location belonging to the earlier developmental forms as in primitive races, and even in Orientals. Satow and Ihm show how fully the Japanese believe this. Closeness to an animal heritage as cause for vulvo-anal proximity is a theory that Klotz has elaborated in a small book. The primitive practice of rear entry in coitus is credited to such backward location.

My collection of notes, drawn from anatomical literature largely based upon European and American women, indicates that so far from the vulva being found in a varying relation to the bony framework beneath, it is singularly constant in its habitat, save in the enlargement and edema of late pregnancy or in prolapse with torn supports. The genitals do not wander; it is the pelvis that swings, and the vulva swings with it. Not anatomy but attitude determines accessibility.

Omitting the pelvic floors of pregnancy and prolapse, and taking the bodies cut down the median line, sixty-four sections were available. Tracings from these were placed one upon the other, and using as the basis for comparison the lower edge of the symphysis and the plane of the outlet, I find that the location of the introitus has a very limited range (Fig. 1). The center is a point, 2.34 cm., a scant inch, below the bone, along an angle of about forty-five degrees from the center of the subpubic arch. With increased lumbar curve and consequent alteration in the angle of the inlet and outlet of the pelvis, i.e. with a downward tilted pelvis, the vulva is swung beneath the trunk and has the appearance of being located far back, as shown in Figures 9 and 98. With a relatively straight spine and level pelvis the vulva appears to be forward and actually is so.

The problem is not quite so simple as this, since infantilism will give a little funnel of entry closer up; and advanced pregnancy will drop all the swollen structures far down both dorsal and pedad (Fig. 64); while prolapse and torn levators will grossly distort these relations.

FUNNEL OF ENTRY IN COITUS

The avenue of approach to the hymenal opening is a perpendicular groove between two elongated cushions covered with fine hair, the labia majora (Fig. 70). In the well nourished virgin with small labia minora, the majora are in apposition. As the larger lips are drawn apart there appears a shallow pocket or recess averaging, in twenty-one examples, 2.6 cm. in depth, and ranging from 1.5 to 4.6 cm.; or an inch as average, with ⅝ to 1¾ inches as limits (Fig. 95). The bottom of the recess is somewhat flattened. This is the vestibule with the hymen occupying the lower section of the pointed oval (Fig. 71). Into this recess the round blunt point of the penis enters on its way into the vagina beyond; and into it the nozzle of the douche tube first penetrates (Fig. 145:II).

If the vagina be considered as the tubular part of a funnel and the vestibule as the conical part, then it may be seen that the configuration of the conical part may be either favorable in guiding the point of the penis, or unfavorable or even actually hampering. Twelve vestibules are pictured (Figs. 92; 94). Our drawing of the largest funnel in the stout woman shows a good entry-way (Fig. 93:D). The shallowest yields a poor antechamber. Figures 92:B and D, and 94:D show such flatness from clitoris to fourchette as to make the hymen opening difficult to find without the help of eye or hand. Three of the twelve are well formed as guides to the vaginal entrance (Fig. 93). Three are defective in this regard.

The nozzle of a douche would tend to enter the dilated meatus in Figure 92:D more readily than the hymen opening. Such enlargement from urethral masturbation is not common, but when found the meatus looks like a vaginal opening (Figs. 87; 90). The largest size urethras pictured in the literature were my cases shown in Figures 87 and 90: S423A, S457 and S430, which admitted the thumb. This is of no practical coital import, since no penis can enter a bladder.

The hymens in Figures 92:A and B would yield readily, and could be either stretched by the finger to avoid "tearing" or entered without any notch or nick appearing, by persistent gentle pressure of the penis day after day. The hymens of Figures 92:C and 93:B are so thick that before marriage they call for a couple of weeks of self-stretching twice a day, or may require cutting under novocain. As to the shapes in Figures 94:A and B, they show such deep pockets at the fossa navicularis, between hymen and fourchette, that the penis is inevitably sidetracked and entry is blocked, and there is no way of securing passage except by cutting such thick structures (Fig. 95). They produced several of the examples in my series of eighteen married virgins, unentered after one to ten years of what was supposed to be normal intercourse. The husbands and wives, though otherwise intelligent, thought the cleft of the vulva was as deep as his organ was expected to go. In some of these, penetration into the pocket of the fossa caused pain and produced surface inflammation.

Premarital examination must not overlook peculiarities of the funnel of entry that will prevent entrance or be productive of painful intercourse. These points are taken up in detail later in the section on dyspareunia in the chapter on coitus.

THE WORN HYMEN

Gradually developed and regularly repeated physiological activity of the female genitalia, that is, progressive sexual intercourse with strong mutual action, is evidenced by a gradual ironing out of the hymen. It is best studied in those who have never had children. Such a hymen is easily outrolled, and exhibits radiating flutings on its vaginal aspect (Fig. 99). As the months or years go by, the grooves grow shallower and the edge less and less in evidence until the hymen may nearly or quite disappear.

Among my personal case histories, these changes have appeared in a reasonable relation to the reported frequency and vigor of coital behavior. In diagnosing causation a confusing factor is the possibility of the effect having been produced by vaginal use of a substitute for the phallus; it is not easy to obtain evidence concerning this habit. In Figure 99 the progressive stages of the worn vulva are shown, with legends that summarize sex practice; and the findings after immediate entry in contrast to those after gradual beginnings of coitus.

COITUS VS. DIGITAL FRICTION

There is scant profit in trying to compare genital alterations following self-induced vulvar or vaginal excitation with those resulting from coitus. In certain places the lines are clear and in others impossible to distinguish.

The focus is on entry or non-entry of the hymen, and on large labia. The first of the two confusions has to do, on the one hand, with non-entry in vulvar coitus, as just mentioned; and, on the other hand, with hymen-entry by fingers, or other substitute phallus, on the part of the virgin.

Indeed a dilatable hymen which is unnicked and apparently intact is found much more often in self-massaged or friend-massaged cases than after coital entry, because the first is almost always gradual and the the second too often sudden and productive of notches (Figs. 73; 99). However, most vaginal autosexual practice is preceded by vulvar friction or pressure, so that the vulvar changes give the clue.

In general, self-orgasm is from labio-clitoridal digital rhythms with consequent alterations described and pictured in this chapter, of which the wrinkled labium minus is the most common change. Urethral friction is infrequent but the distensibility clear. In those most highly endowed sexually, large cockscomb labia associated with full coital response may give double witness.

Very vigorous or frequent coitus is suggested by any hymen easily outrolled bearing shallow longitudinal folds, its edge disappearing or fully polished away (Fig. 99). The size of the vagina furnishes further clues to activity, frequency, or male length, and gradual lessening of vulvar distensibility points to the husband's lessening vigor (Figs. 57; 60; 61).

One may never lose sight of the fact in this kind of study that all our evidence is clouded and partial, and of value only when an adequate proportion of the verbal testimony tallies with the physical findings. This is discussed further at the end of the chapter.

THE CLITORIS

There are not many cadavers in which median section has successfully shown the clitoris. The crura show in 35 sections, the glans of the clitoris in less than ten. We should exclude those drawn from cases with prolapse, where all structures are drawn down, or from those of pregnant women, where all the structures are enlarged, unless it appears that the clitoris has not taken part in the displacement or the swelling. What data there are have been assembled in Figures 77, 77a and 77c.

The size of the clitoris varies considerably, with small apparent relation to general body dimensions, and seems also relatively little affected by external events.

Because of the way in which the organ is attached to the bony structure, and is curved, and covered by surrounding tissues of prepuce and labia minora it is difficult to measure anything but the thickness of the corpus, with poorly defined limits. The glans is the easiest portion to measure or estimate and its transverse diameter the simplest.

Here, as in other regions, one learns to ask, not what is "average" or "normal" but rather "what is the most common dimension or grouping?" That is, the true measure is the *mode* rather than the arithmetical *average* or *mean*.

Anatomists vary in their statements, giving the lengthwise diameter of the glans anywhere from the 8 mm. of Morris, and the 6.7 mm. of Testut to the 5.6 mm. of Waldeyer, Poirier and Jayle.

But if we examine the distribution of measurements in 100 case records, as given in the chart in Figure 77c, we find that the most usual lengthwise diameter is 4 to 5 mm. with the transverse grouped a little lower, from 3 to 4 mm. The relatively high "average" figures quoted are probably affected by the presence in the various lists of intersex individuals, whose unusual appearance would lead to the taking of measurement.

Groups. In speaking of clitoris size, grouping into *intersex*, *large*, *average* or normal and *small*, is a clinical convenience (Fig. 77c). The pseudohermaphrodites, who are mostly males with testicles hidden and with breasts, exhibit an intergrade copulator, of which examples from unpublished histories are shown in Figures 117 and 119 in the chapter on male anatomy.

Next to these in size is a series of developments of the clitoris which warrant the suspicion that the possessors belong near the intersex line. For example, S240 in Figure 86 occurred in a tall, masculine type of girl with some secondary male characteristics, with years of clitoris friction.

The normal or average, shown in S128, S41 and S7 in Figure 78 occurs with very little relation to the presence or absence of a friction history. The examples of small clitoris here given, belonging among the 5 per cent of our series (Fig. 77c), are chiefly in vulvas showing marked labial hypertrophies. The corrugations in S712, Figure 82, have ended in the usual atrophies. In a vigorous mother, S709 in Figure 82 and in three of her four daughters, S402, S403, S284, extreme corrugations are combined with a tiny clitoris.

Absence of the *clitoris* is pictured in Figure 86. There are two small lateral knots that may warrant Blair Bell's designation as "diphallus." The friction evidences are outstanding in Bell's and in my two cases. His fourteen year old girl was evidently a urethral masturbator, and as in some of my operations, restretching from renewal of friction caused relapse (Fig. 87).

A very minute size is not infrequent, even in the presence of other large developments. In these cases the prepuce cannot be stripped away. The glans clitoridis seems sclerotic, hard, fibrous, without projection or erectility.

Infants and children before puberty are exceptions to these generalizations on the relative infrequency of enlargement of the clitoris, since in them the habit of masturbation usually increases the size, which returns to normal when excess in the habit is checked (Fig. 79).

Again, size is not necessarily a criterion of responsiveness. A very tiny clitoris, so thin and low it can hardly be picked up by the fingers, may be associated with powerful orgasm from friction or pressure on the organ alone. The other extreme in bulk is found in intersex individuals whose sexual impulse and activity is usually strongly developed (Figs. 86; 118; 119). With women at sixty or seventy the clitoris may be prominent and large (Figs. 86:S464; 102).

High Clitoris in Frigid. According to Narjani of Paris, successful response on the woman's part during intercourse depends on the nearness of the clitoris to the introitus vaginae. This author recognized three groups in which: (a) The clitoris is less than 2.5 cm. from the meatus urethrae making up 69 per cent of her 200 cases; (b) The clitoris is 2.5 cm. above the meatus, 10 per cent; (c) The clitoris is more than 2.5 cm. above the meatus, 21 per cent. Women belonging to the first group, according to Narjani, always have a climax in coitus, whereas those in the third group never are able to reach it.

These sweeping statements are not borne out by our histories as some wives in the short measurement group report never having had a climax, whereas some in the long measurement group do reach one (Fig. 86). In 100 measured cases in my series the relative frequency of the various groups corresponds very nearly to the figures given by Narjani, with 74 falling in the first group, a distance below 2.5 cm.; with 7 in the middle group, just 2.5 cm.; and 19 in the third. Of the 19, six report as follows: two had satisfactory and fully developed feeling but were not asked about orgasm; and four definitely experienced climax. Two were unmarried, and there was no relevant entry about the other eleven.

In this group of nineteen with relatively high clitoris the frequency of large, corrugated labia minora (Fig. 86, top left), and several patients with clitoris above the average in size (Fig. 86:S240) suggest a long habit of self relief (or an intersex type) as possible reasons for lessened interest in coitus. Narjani neglects to note these possibilities as well as other factors of failure, such as quick emissions on the husband's part, or faulty posture; and she also fails to recognize the possibility of vaginal orgasm. Her answer is too easy.

ERECTION AND ERECTILITY

Erection and erectility are terms calling for definition since a variety of processes is involved. Erection could be stretched to cover four processes:

(1) Rigidity by obstruction to return flow in a cavernous structure, with inelastic walls, e.g. penis.
(2) Soft swelling of engorgement of a venous plexus, e.g. bulb of vestibule.
(3) Slight enlargement and darker color due to congestion, e.g. cervix or vulva.
(4) Firm shrinkage, and prominence from shortening of smooth muscle fibres, e.g. nipple.

The word, as used for the first process, that is, rigidity of bone-like hardness in the penis, is a simple matter for agreement, however strange and complex the mechanism (Figs. 120 to 123). So it is for the limited enlargement of the clitoris, with its relatively uncomplicated but somewhat analogous cavernous structure (Figs. 75; 77b).

The second and fairly evident process occurs in the bulbs of the vestibule, with its mesh of veins (Figs. 75; 101).

The third process is open to some misunderstanding for it entails no hardness and applies to surfaces that swell very moderately; like the inner aspects of the vulva, the hymen (Fig. 101), vestibule, fourchette, and the inner area of the minora; and also to meatus and bladder-base (Fig. 87) and to anal mucosa, all of which may become red, dusky red or purple.

The fourth may produce a conspicuous upstanding, even a degree of rigidity, as in the nipple and its areola, or the occasional change to firmness of the whole breast (Figs. 103; 104). Analogous to this are other shrinkages due to unstriped muscle contraction, such as that of "gooseflesh," or in the skin of the scrotum or of the prepuce. may occur in sex excitement (Fig. 81).

VULVO-VAGINAL CHANGES IN EXCITEMENT

Active or erectile changes during excitement which mostly cease on detumescence are these:

(1) Free secretion from vulvo-vaginal glands.
(2) Congestion of surfaces and fullness of superficial veins with color changes.
(3) Protrusion of erectile bulbs of vestibule.
(4) Swelling of lateral vaginal walls.
(5) Distension of veins of broad ligament.
(6) Clitoris erection.
(7) Labial "erection."
(8) Levator jumpiness and rhythmic contraction in orgasm.
(9) Protrusion of hymen.
(10) Distension of vessels in trigone of bladder.
(11) Fullness of ano-rectal veins.

Chronic or persisting alterations due to strong, long continued and close-set repetition of excitation are the following, the numbers corresponding with those in the list above:

(1) Inflammation at mouth of duct of vulvo-vaginal gland.
(2) Prominent veins in certain locations about vulva.
(3) Varicosities of bulb, and of pars intermedia toward clitoris.
(4) Varicosities in base of broad ligament.
(5) Varicosities in upper part of broad ligament.
(6) Enlargement of clitoris.
(7) Labial enlargement.
(8) Levator thickening and irritability, followed by relaxation.
(9) Hymen gaping, worn, ironed out or disappearing.
(10) Chronic bladder base congestion.
(11) Hemorrhoids.

VULVO-VAGINAL SECRETION

Outpour of clear *mucus* is the most frequent evidence of roused desire. This is generally recognized. However, a girl may be ignorant of the cause of this "discharge" and complain that she has a frequently recurring "leucorrhea." She has failed to note the connection between labial wetness and petting, or dancing with certain demonstrative partners; nor has she understood why it occurs more often just before or after the period, the times when erotic feeling is at its height. The amount of secretion developed by active excitement is much in excess of that required to keep the opposing mucous membranes moist; it is clear as glass, tenacious and persistent, without being sticky. No other lubricant can compare with it in efficiency for a certain smooth and slippery quality nor in ability to foster pleasurable sensation for both partners. Excess seems rare, notwithstanding the habit of the famous artists of the popular Japanese woodcut to depict it pouring forth, and the practice of the male actors in Greek comedy, who played the parts of certain women, to wear bags of fluid to denote genital excitement.

Unwise stress has been laid on mucous flow as an adequate gauge of preparedness and even as sole evidence of readiness for the entry of the male. Books of instruction written by laymen for the married not uncommonly forbid the husband to attempt any entry whatever until the secretion is abundant, declaring that the wife cannot otherwise be sufficiently prepared and ready. This is one of the examples of a useful general principle translated into an absurdity by a sweeping prohibition. For it must not be overlooked that there are women of strong passion, capable of vigorous orgasm, who show little or no mucous flow; and anatomists tell us of individuals who lack vulvo-vaginal glands altogether. As the vagina has few or no glands, any lubricating secretion found in such women comes from the cervix. Artificial lubricants can supply the need.

CONGESTION

The second most frequent alteration that demonstrates erotic feeling is *congestion* as shown by redness or duskiness, or even purple tones, on surfaces that are usually pink. Small veins may stand out, particularly on the inner surface of the larger lips alongside the clitoris (Fig. 96). Actual varicosities of the vulva are rather rare, but the fullness of blood may give a general appearance of swelling, or what might be called an all-over erection (Fig. 101). The coloring at its fullest intensity, is like that of the glans penis, especially the corona, during erection.

The *labia minora* are provided with numerous vessels and therefore a darker or dusky coloration can occur during erotic stimulation, but the absence of cavernous structure prevents true erection. Marked increase in size does develop, but this is a very slow process extending over months and years, except for the occasional acute edema from violent friction and pressure (Fig. 82: S728A; Fig. 84, four examples). This is found also in the prepuce, which may well be considered as part of the lesser labia (Figs. 82 and 84).

The area of most marked erection is on each side of the entrance to the vagina. Here the distension with blood of the erectile tissues of the *bulbs of the vestibule* produces a bulging inward of lateral globes whose size will vary from that of a chestnut to a horse chestnut. These rounded prominences in contact are shown in Figures 101:S285A, and in the lower part of 102; while they are drawn apart in Figure 101:S108 and S132. As the left bulb is usually structurally larger than the other, one-sided protrusion is not uncommon. In the intersex instances left bulb protrusion is pictured in Figures 118 and 119.

At the same time as the swelling of the bulbs or a little later, under strong excitement, the *side walls of the vagina* may swell inward. As one looks into the speculum, say an instrument with blades one and one-quarter inches wide, rounded columns creep in from the side until they meet in the middle and shut off all sight of the empurpled cervix (Fig. 102: A, B, C). Indeed all the structures by now are dusky red or purplish red. While there are no definite cavernous bodies with limiting membrane in the lateral vaginal walls, such as exists in penis and clitoris and bulb, a lacework of veins runs along the lateral walls of the passage (Figs. 62; 66; 67; 96), much more closely set than those along the anterior or posterior walls. As masses, these lateral vaginal veins are not discoverable by the finger. The places where such swellings are readily palpable are alongside the uterus (Fig. 68).

VARICOSITIES

Varicosities of the broad ligament are well known and not difficult to recognize, provided certain steps are taken (Fig. 68). When at ordinary examination, with one or two fingers in the vagina, a soft "tumor" is found in the tubo-ovarian region, the examining table is to be tipped in two ways. With the foot of the table dropped so that the patient is almost in a sitting posture, the bunch of angleworms will be found larger and somewhat tense. Then, when the head of the table is lowered to an extreme Trendelenburg slant it is found that the mass has disappeared. A simpler method is to leave the patient in the horizontal position and while the lower fingers lift the mass, the abdominal fingers gently massage the neighborhood. By this means the "tumor" vanishes. It returns when the patient sits up.

Such varicose conditions are found in habitual sexual erythism, particularly erythism long unrelieved. They are found also in chronic constipation or in those who work stooping over while wearing snug corsets or belts; and like piles, they occur in the pelvic stagnation of defective heart action.

One of several evidences of prolonged, oft-repeated vulvar congestion is the presence, as a small surface varicosity, of outstanding *vulvar veins* (Fig. 96). One must exclude other causes, such as veins left over from the vulvar varicosities of pregnancy, or the stagnation of heart disease, or general vein weakness and protrusion. Very marked engorgement of the veins of vulva, vagina and uterus may occur with even moderate degrees of erotic feeling, or even without genital consciousness of desire. This is not easy to determine in the woman but by analogy with the male it may be shown.

The male is readily studied because he carries a gauge openly. In the flaccid penis of certain observed and recorded instances, the time of the cycle and the degree of distension of the seminal reservoirs may be deduced from the condition of the veins of the surface of the penis. For example, in a man whose cycle is five days and in whom the time is about due for annoying erections or strong desire or involuntary ejaculation, there appears an engorgement of the surface vessels as seen in Figure 68. Suppose an orgasm takes place. An hour later (or on the morning following an evening orgasm) the shrinkage in surface vessels will be marked, as shown in this figure. It goes without saying that the preliminary observation is under ordinary conditions and not following a hot bath or suggestive reading or exciting company.

Now let us apply this analogy to any woman normally endowed with sexual capacity and having fully experienced sex desire and orgasm. If we look at the venous supply of the vulva in Figure 75, of the vagina in Figure 66 and of the uterine neighborhood in Figure 68, and imagine any such fullness of the vessels as we found in the surface layer of the penis, we can see adequate cause for aching congestion of all the female pelvic organs, and comprehend what regular, normal detumescence might do for it. We can also see what persistent engorgement will do in the case of women with vulvar hypertrophies and an intact inelastic sensitive hymen and an uninfected passage. Years of congestion may bring about in the actual virgin conditions like those after tears in labor and neglected erosion, namely, cervicitis, erosion and hypertrophy as shown in Figure 29.

Varicose broad ligaments may be compared with male varicocele. The group of veins about the testicle may grow as large as the testicle itself, with attendant aching and need of support and lifting by a suspensory. So aching from varicose pelvic veins in woman may be helped by raising the uterus on a pessary. In either sex, ligature is required when the drag is actually disabling.

CLITORIS ERECTION

The *clitoris*, as a miniature penis, has in its spongy bodies the same provision for erection as the corpora cavernosa of the male, but to so relatively small a degree as to be little recognizable clinically (Fig. 77). Observation of the male's erection is simplified by its outstanding location, whereas in the female the corpora cavernosa and the crura are all hidden between the labia minora, or underneath their cushions of fat, so that neither eye nor finger tip readily detects them. Nor does the glans of the clitoris show the quick vacillation in size which the penis shows. Erection is striking chiefly in the organs of intersex individuals, shown in Figures 118 and 119, or in the twenty per cent of women having a fairly large clitoris.

That the older woman with strong erotic sensation demonstrates erection relatively often is probably due to shrinkage of the surrounding pads that allows easier observation (Figs. 86:S464; 102). Here also the color changes in the way of dusky hue may actually be more marked owing to the more sluggish circulation in older people.

I draw attention to the relative infrequency of distinctive and visible erection as a sign of excitement, even in cases where there is strong feeling centered in the organ. In many women who have presented the most definite testimony, verbal and hypertrophic, of years of frequent self-induced pressure or friction orgasm, the clitoris is found small and hard, and even minute (Fig. 82: S402; Fig. 83: S361).

One of the frozen sections shows large cavernous bodies leading up to a tiny glans. If pressure on the crura, the wide spread legs of the clitoris, as they follow outward and downward along the pubic arch, is the really effective excitant, such intermittent crural pressures and tractions may be the actions which drag on and enlarge the minora (Fig. 75:A).

I have on file a small number of reports showing that pronounced erection can occur. In these the observer noted that the organ before erection was so soft that its location was not easy to define and it was difficult to distinguish from a fold of the labia (Fig. 102:S870, at 40). But with excitement, a pea-sized or half pea-sized protrusion of firm rotundity would develop and sometimes yield to the touch a regular throb. Such a tenseness, such a very minute "leap," recurring once or twice a second is probably due to the contraction of the pair of constrictor cunni muscles, of which one is shown in Figure 75:B. Pressure from below, or lifting is found to be most likely to induce this rhythm when two finger tips palpate the tiny jerk, on each side, at the base of the glans clitoris, with slowly increasing size and tension in the glans. The throb has been reported as induced 200 times and more in as many seconds. The activity may end in orgasm or the response subside.

Of the constrictor radicis clitoridis (Fig. 75:B), Holl says that this ribbon like muscle is at times very thin, at times very well developed on one edge. The rear origin is in the central tendon of the perineum with fibres running at times into those of the anal sphincter. It is bounded by the compressor of the bulb on the rear; passes along the vagina, reaches upward to the clitoris and makes fast by tendinous fibres into the tunica albuginea of the side of the body of the clitoris near the knee. The fibres end partly in the lower inner surface of the clitoris fascia, whence the dorsal vessels and nerves go by; this part of the fascia of the clitoris being called by Kobelt the tendon of the muscle. Compare with the male, Figure 121. Kobelt notes that a bundle 5 cm. long runs from the constrictor up toward the mons to be inserted into its outer layers.

The compressor of the bulb covers the bulb and the vulvo-vaginal gland.

The upper curve of the corpus behind the glans, the "knee" of the clitoris, is always palpable, even when only a string in thickness; but this portion does not often seem to straighten and to throw the glans forward and upward as shown in Figure 116.

VESSELS DURING ERECTION

Ebner (1900) found semi-circular thickenings in the lining of arteries of the penis, at the points of exit of branches. These occurred even in arteries less than one mm. in diameter (Fig. 77b). The intima splits into two layers to enclose bundles of muscle fibers which run lengthwise. Thus valves are formed which can completely block the bloodstream when the circular muscle layer contracts.

Benda (1895 and 1902) discovered that part of the dorsal vein of the penis looked like an artery having an extended network of cross pieces or ridges capable of narrowing its main lumen and shutting off the branches that feed it. Eberth found the same in the vena profunda.

Golowinski (1905) published the diagrams showing the thickening of the endothelium above the muscle bundles, which are copied in Figure 77b. At the location of a branch vessel, these combinations form steep-sided rolls or cushions (Wülste) ready to act as valves. Such valves are found in the vessels of the corpus cavernosus of the urethra, but are not as numerous as in the corpus of the penis.

Golowinski found the same formations in the vessels of the female genitalia. The anterior labial artery throughout its course shows a strongly developed median muscular layer, and just before splitting up at the base of the labia majora the Ebner bolsters are of almost exactly the same kind as in the penis, being semi-circular in transverse section, and symmetric.

The posterior labial arteries possess an extremely thick elastic inner layer and a weak outer layer. At the thick areas the intima splits into layers between which smooth muscle fibres run, while they continue on either side as circular fibres. The same holds true of the veins.

In the less deep parts of the labia majora and minora these valves are not found, but there is notable thickening of the media. In the arteries of the bulb of the vestibule, neither thickened media nor valve forms were found. There are, however, in these arteries certain irregular longitudinal bundles of smooth muscle fibres close to the adventitia which may act like the bolsters in the other arteries and account for the erection of the bulb.

The veins of the labia majora and minora show the same bolsters on the intima as the arteries do. On the whole inner surface there is a system of quite sharply rising ridges, running lengthwise, most marked at the base of the majora. These are much more pronounced than in the arteries, and look like those found by Benda in the vena dorsalis penis. They are capable of shutting off the return flow of blood. Near the surface they are fewer and less developed. The large veins of the minora show these formations, but not the structure of the media seen in the majora. For closing off the veins from the bulb, the bulbo-cavernosus muscle suffices.

The arteries of the clitoris are built like those of the penis, showing the same valve-like thickenings, these being especially prominent in the arteria dorsalis clitoridis.

Mechanisms of erection are considered further in the next chapter.

EXCURSION OF CLITORIS

The other relevant finding is the extent of excursion, or the range of mobility of the glans (Fig. 77:D). The clitoris is hung by its suspensory ligament (Fig. 77:B) to the front of the symphysis. The glans has two capacities for motion. One consists of straightening out of the arch or "knee" in erection. The other depends upon stretching of the ligament and the adjacent structures. I think the range of mobility of the glans, when not subjected to frequent or strong traction, is not as much as an inch along the median line. I note that increased excursion and its direction or range as shown in Figure 77:D bears a direct relation and proportion to the displacement and vigor described and demonstrated by patients who are given to such autosexual relief. This observation is based upon some hundred measurements checked up against reported or demonstrated action. With mere pressure no increase in excursion results (Fig. 78:S128, S41, S7).

PROGRESSIVE ENLARGEMENT OF CLITORIS

It is commonly asserted that a habit of long and repeated friction increases the size of the clitoris. But such a progressive or permanent result is not to be expected any more in the clitoris than in the penis, and little claim is made that the size of the penis is in proportion to the frequency of erection.

Increase in size, was determined only 36 times among 367 cases in which were other well-marked vulvar hypertrophies, that is, in 10 per cent. Moreover, a number of my records reporting self-induced orgasm daily or oftener over many months or years fail to show clitoris enlargement. We have shown that some huge labial and preputial swellings, whether it be ridged and corrugated cockscomb or smooth leather type, frame a minute, hard clitoris (Fig. 82, top).

In older women the size and projection may be only apparent, owing to shrinkage of the fat pads in the neighborhood leaving the clitoris conspicuous. I am inclined to believe, however, that as the penis of old men is said to elongate, so the clitoris may also.

The following instances given as "enlarged clitoris" by the authors, are really intersex individuals, who are mostly males. Cruveilhier had a case in which the free portion measured 5 cm. or 2 inches. It may attain a length of 13 cm. (5½ inches) according to Tarnier and Chantreuil. Parent-Duchatelet saw three times, among 6,000 loose women, an organ as large as the penis. No enlargement of the clitoris is reported among the Hottentots. Otto's case is a Negress. Flattening into a ridge or tent-shape is not uncommon. (Figs. 83:S31; 86:S240) Martineau calls flattening a certain sign of Sapphism.

VULVAR HYPERTROPHIES

The presence and meaning of certain alterations about the vulva are little considered either by the general practitioner or the gynecologist. In 1902 I first called attention to the absence of clinical observations in this matter and published a statement on findings in a series of 427 private patients (R. L. D. 1902).

German, Danish and Italian reports have been made on the incidence of these alterations among Western and Oriental women, and exact descriptions corresponding to my own are found, though not with the same interpretation.

The following paragraphs are condensed from the 1902 article, supplemented by later observations and comparative notes by other authors.

The *type*, or full development, consists in a finely wrinkled and deeply pigmented enlargement of the labia minora and hypertrophy of some adjacent structures. Thickened, elongated, curled on themselves, thrown into tiny, close-set, irregular folds, as in a cockscomb, the lesser labia protrude, in all positions, through the larger labia (Fig. 80). The pigment deposit varies with the general type of coloring (Figs. 85; 88). One labium is sometimes greater than its fellow. Sebaceous follicles are often conspicuous as whitish spots (Fig. 85). The prepuce commonly, and the fourchette occasionally, participate in the corrugation and duskiness, or one of these alone may be affected (Figs. 80; 84:S630). At times a wrinkled band runs off to the labium majus (Fig. 84). Certain veins near the clitoris stand out (Fig. 96). At the mouths of each urethral gland a flap-like protrusion may be seen (Fig. 90).

Greater power and size of the muscles of the pelvic floor accompany the other hypertrophies. Infrequently, there may be distinct increase in the size of the clitoris. As described later, there may be enlargement and erectility in the areolae and nipple resembling those of late pregnancy (Fig. 104); and "chronic mastitis" is frequent (Fig. 49).

At a later stage, flabbiness of the labia minora denotes atrophy of the structures once enlarged, but the hall-marks do not disappear till after sixty (Figs. 80 to 82).

These alterations are believed to be due to oft-repeated, prolonged erotic excitation, other than in coitus, and caused by pressure or friction or sexual day dreams. Pregnancy produces increase in size and some surface irregularity but never the fully developed changes here specified. Friction by napkin or clothes may further the enlargement.

Extreme elasticity or relaxation of the vaginal outlet, and hypertrophic enlargement of the vagina, belong not to vulvar but to vaginal excitation. For completeness, these conditions will also be considered here, especially in women who have never borne children. Internal changes occur in these latter cases only about one-tenth as often as the external changes, but are sometimes striking: for example, a hymen to all appearance virgin so distensible that it admits four fingers or the whole hand without discomfort (Fig. 100:S339).

MECHANISM OF HYPERTROPHY

In searching for an explanation of corrugation and striking largeness of the labia minora, I suggest two possible mechanisms. Either accords with my clinical histories better than the theory of Jayle that big labia belong to a type in which special endocrine endowment and activity occur, and that the size is due to the same cause as genital growth at puberty, carried further.

It may well be that endocrine stimulus, especially of pituitary, thyroid and adrenal, or the group involved in sex activity and gonad growth is more active in some individuals than others; and that, conversely, the infantile type of vulva and uterus, which may be coupled with full sexual urgency, is the result of defect in such stimulus. I submit, however, that a simple mechanistic explanation is offered by a large number of case records wherein the stages of increase and corrugation, and later, the stages of wilting or shrinkage, have been watched and described and drawn to scale, in some instances for periods covering decades.

Two processes are clearly in evidence: a third may also have to be invoked as explanation.

First, and least frequent in these drawings, is active swelling, that is, attacks of *acute edema* following a session of powerful friction and pressure, at times applied with all the vigor the hand, or both hands together, can give (Figs. 82; 84).

Second, rhythmic *traction-relaxation* on elastic and muscular fibres, covering periods of months or years, with a rate of growth showing some proportion to the frequency or degree of such friction or pressure.

Third, repeated *congestion through phantasy* and stimulation of the genitals without friction or pressure; at times without climax, or what one might label an application to autosexuality of the reservatus principle of coitus.

Although I have encountered and recorded scores of instances of flat denial of friction or pressure, followed by full reversal of testimony and have learned to suspend judgment, I have at times been puzzled by two seemingly inexplicable contraindications between findings and behavior. One enigma is the statement of a habit of vulvar orgasm daily or oftener for months, or two or three times a week for years, yet with little evidence in the way of any form of enlargement. The converse has been extreme enlargement, coupled with categorical denial of friction or pressure, on the part of a girl or woman whose word carried full weight.

The first riddle has been solved at times by finding some unusual method of inducing orgasm. For example, there was the patient who constituted a baffling problem because of extreme frequency of reported orgasm, but without pressure by finger, thighs, pillow or mattress; she was finally observed at one visit to the office to be sitting on her heel. Or, a woman of multiple climaxes has a pelvic inclination that brings her vulva against the seat of an automobile, bus or train, and the gentle jar does the rest (Fig. 73). In neither instance are the tissues subjected to friction or excursion; the structures are supported, the emphasis is on orgasm, the congestion is brief but strong, the hypertrophies absent. Perhaps the vagina is used (Fig. 78:S59).

The second puzzle, enlargement without friction as main cause has received occasional explanation by finding prolonged and frequently repeated congestion of the region from day dreaming, accompanied by agreeable erotic sensations, often without climax. Here one may speculate on the effect of long periods of increased blood supply favoring growth, but the explanation is not really adequate except for varicosities. In the end, for such cases, we may have to appeal to the bio-chemistry of gonad development for an explanation. This satisfied Jayle, but the lack of anything like it occurring in the male and the statements of pressure by so relatively large a number of witnesses is what gives me pause.

Frequency. How often labial enlargement occurs among women in general no one may say. But among patients who present pelvic lesions, or who suffer from pelvic disorders, no inconsiderable number is found. In a series of one thousand consecutive gynecological patients, I discovered that 367, or more than one in three, showed two or more of the various vulvar hypertrophies which are here considered. In this check-list all doubtful cases were excluded. It was noted also among 150 histories of neurasthenic patients and chronic or relapsing cases, selected somewhat at random from the longer series, that the proportion of hypertrophies ranged up to 56 per cent, as compared with the 37 per cent average.

Observe that it is said that at *some* period or other in the patient's life a cause was operative of which the marks remained—not that all were still subject to chronic genital excitation at the time of observation. This matter is discussed further at the end of this chapter.

CLASSIFICATION

In attempting an orderly statement of the matter we may somewhat arbitrarily divide the cases of hypertrophy in three ways, by degree, by stages and varieties; each subdivided further as follows:

Degree of Enlargement: (1) Moderate; (2) Average; (3) Very great.

Stages: (1) Beginning of increase; (2) Full development; (3) Atrophy.

Varieties with Hypertrophy Affecting: (1) Labia minora proper; (2) Prepuce; (3) Fourchette and perineum; (4) Accessory nymphae; (5) Clitoris; (6) Meatus; (7) Pelvic floor and levator; (8) Vagina; (9) Any combination of two or more of these.

DEVELOPMENT

A *type* case has the following history: In childhood, or after puberty, the prepuce is a smooth tent over a small clitoris; the lesser labia are smooth and of an inverted V-shape in transverse section (Fig. 71), skin ridges pink in color hidden behind cushions of the outer labia (Fig. 70); the meatus is little elevated; the openings of the vulvo-vaginal glands are hardly to be detected along the outer lateral edges of the hymen.

A few months later one may find both labia minora larger, thicker, darker, a little ridged or with beginning folds on one or both, and showing between the majora (Fig. 80). Perhaps one is distinctly edematous, thereby indicating recent active manipulation (Fig. 82:S728A; Fig. 84).

One to four years thereafter corrugations, or tiny folds, cover the surface wholly or partially; and in standing the inner lips project a quarter or half-inch from between the outer (Fig. 80); and they are darkened and much enlarged, one usually larger than the other (Fig. 83). The prepuce shows some wrinkling; the Bartholinian duct openings are congested; white follicles show as spots or are felt as hard prominences on the inner faces of the labia (Fig. 85).

Later still there may develop a very great increase in the weatherbeaten appearance and in size, pigmentation and corrugation, with hypertrophy at the posterior side of the meatus and anterior end of the hymen (Fig. 90). The labia minora hang down in folds like curtains, with one loop backward near the middle (Fig. 83). The veins are prominent in the folds. The vulva is insensitive.

The last stage is *shrinkage*: the surfaces of the lesser labia become smoother as the muscular and elastic fibers under them atrophy; but the thin curtain-like lips still show distinctive increase in area, if not in thickness, and still hang in fine folds that cross no longer (Figs. 82; 93:B, C, D). Until old age the loss is never sufficient to bring them back to the former narrow ridge of projecting skin, though the cockscomb becomes smooth (Figs. 80; 82).

The *maximum alteration* found in vulvar cases among northern peoples, is shown in such a set of condition as the following:

A young brunette, a virgin, of eighteen or twenty, well developed, of excellent antecedents and personal history, refined, reticent, studious, is suffering from headache, depression, leucorrhea, bladder irritation, dysmenorrhea and menorrhagia. The breasts are large and nodular; the nipples prominent; the primary areola distinctly pigmented and elevated, while bearing small follicles; and the second areola is plainly visible, corrugating into fine folds at a touch, or merely contracting (Fig. 104). A strong growth of pubic hair covers thick, coarse-skinned labia majora. Between these outer labia protrudes a roll of brownish-black skin folds. Each inner labium is curled up or else hangs in a double fold, the anterior partly concealing the rear portion (Fig. 80). Drawn out, the projection reaches one inch (in some cases two) beyond the majora, elastic, insensitive, thick and wrinkled in deep furrows (Fig. 83). The enlarged sebaceous glands feel to the touch like numerous embedded grains of sand (Figs. 85; 97:A). The prepuce, thickened and thrown into wrinkled folds, is continuous with these labia. The minora unite in a sweep behind so that the fourchette is as dark and many-folded as they. Laterally, from them, two bridges of the same fine-laid folds and furrows run across the shallow sulcus that lies between inner and outer labia; this fold hangs up or puckers the center of each labium minor. The prepuce is partly adherent and underneath it smegma lies hidden (Figs. 86:S27; 77a, bottom). The meatus when drawn open presents two curious flaps or ridges into which the forward edges of the hymen run (Fig. 90). The openings of the glands of Bartholin and of Skene are red and gaping; the hymen is too small to admit the finger tip. The anus is surrounded with small piles and is pigmented like the labia minora. All these changes together are not commonly seen in the same individual.

CHANGES IN LABIA MINORA

This is the most frequent location of hypertrophy. It was well marked in 65 per cent of the 367 cases in which a detailed statement of the varieties of hypertrophy was entered. The appearances have been described. Rarely there is great increase in size and thickness without the typical corrugation or folding (Fig. 83). In their extreme form they have long been known under the term "Hottentotten-Schürze" or Hottentot apron. This designation is a gross error. It is no racial or tribal peculiarity, but common to Europe and America; while Japan pictured it centuries ago.

In describing the labia minora it is difficult to decide which is length or breadth, and the reports in the literature do not define the terms used. By a "length" I have arbitrarily chosen to indicate the longest measure of the spread-out labium, very little stretched, from its outer curve to the median line of the body.

While a "length" of 12.5 to 18 cm. (5 to 7 inches) is spoken of in the references to these enlarged labia minora among Hottentots, as if such size were frequently encountered, and while the fleshy cushions are supposed to hang down as far as the middle of the thigh, it is to be noted that the three autopsies on women of Bushman tribes by Cuvier, Luschka, Flower and Murie, also Waldeyer's case, only showed a projection of 3 to 5 cm. (1¼ to 2 inches).

The pictures of the case in Cloquet's "Anatomie" (1825) show a strongly stretched labium. This case is of a size not infrequently encountered in northern countries, and found among American whites and Negroes. Barrow says the nymphae develop with the growth of the woman; the largest actual measurement he records is the largest I can find in the literature, namely 12.5 cm. or 5 inches. Peron speaks of 7.5 cm. (3 inches); Blanchard's picture of a "tablier" is evidently a fleshy exaggeration, badly drawn. Broca, Karl Schroeder, Hartmann, Ploss and doubtless many others have drawn attention to the fact that these great labia are not confined to Africa, but are encountered among the women of France and Germany. Winckel (2) has found a length of 9.5 and 11.5 cm. Bergh saw among 2,981 women the following instances: 146 of 2 cm., 170 of 3 cm., 32 of 4 to 5 cm., and 20 of 5 to 6 cm., or a total of 368 rather large cases.

I find at least 29 cases among my notes of labia which are 3 to 5 cm. (1¼ to 2 inches) in length, that is, as long as those of most of the carefully recorded cases among the Hottentots. Three centimeters and four are very common dimensions of the greatest antero-posterior dimensions of the labium, measured from a point about midway on a line drawn from clitoris to the rear end of the nympha (Fig. 83).

By strong stretching a labium can be doubled in these dimensions. The largest development I have seen, measured from tip to tip of the labia gently stretched in the form of the wings of a butterfly or bird, was 15 cm. (6 inches), each labium measuring 7.5 cm. (3 inches). These could be pulled by moderate traction to a spread of nearly 23 cm., or 9 inches (Fig. 83). Here it will be seen how nine examples run between 5 and 7.5 cm. or 2 and 3 inches.

Asymmetry is less frequent than equal development, and was observed in only 12 per cent of the 367 cases of vulvar hypertrophy, the enlargement being distributed indifferently between the two sides. The enlarged portion may be located at any place along the edge of the labium, but is usually anterior or central. In its extreme form one lip will be normal while the opposite one hangs in a long curtain or tab. In such case the thickened portion is often in the shape of a long rectangle pendant from the center of the labium (Fig. 88).

MINUTE ANATOMY

The basic structure of the labia minora is a fine connective tissue rich in elastic fibres, with smooth muscle fibres and numerous wide veins. The "little shame-lips" are capable of turgescence resembling erection during sexual excitement, says Waldeyer. Gussenbauer calls this structure "cavernous" and Ballantyne speaks of the muscle fibres "surrounding the vessels." The nerve end-organs, says the last observer, are prominent structures in the normal nymphae of the adult.

Carrard examined a pair of enlarged nymphae removed by Chrobak. He saw no enlargement of the vessels, but a great increase in the number of nerves and in the twist of them. "As a striking development it may be stated that relatively large bundles of axis-carrying fibres reach close to the epidermis." Carrard tells of adenoid growth about the opening of the sebaceous glands. He found Meissner's touch corpuscles in normal labia occurring in the papillae, and resembling those only found elsewhere in palm and sole, in nipple, on eyelid edges, the flexor surface of the forearm, the vermilion edge of the lip, and in the clitoris. In the hypertrophied cases he found, first, enlarged Meissner's corpuscles; second, globular terminal bulbs, with increased cellular elements; third, a peculiar end-organ.

Ballantyne finds the Meissner corpuscles and globular terminal bulbs; Krause only the globular end-organs; Schweigger-Seidel and Kölliker only Pacinian corpuscles.

Webster found a few Pacini or Vater corpuscles and Krause's end-bulbs as the most numerous form of nerve ending, both in the papillae and in the deeper layers of the corium. In the clitoris he found a few Meissner corpuscles, end-bulbs, Pacini corpuscles and the genital corpuscles of Krause. In the prepuce he detected globular endings resembling the genital corpuscle which Krause limits to the clitoris, and rarely, both Wagner and Meissner touch corpuscles.

In cases of pruritus Webster determined a slowly progressing fibrosis affecting chiefly the nerves and nerve endings of the clitoris and labia minora. Many of the nerves acquire a dense fibrous character, some appearing as well-marked fibrous cords, the nerve fibres being compressed or destroyed. The end corpuscles show the same changes. The pruritus changes in the connective-tissue of the nymphae and clitoris are of a sub-acute inflammatory nature, evidently more recent in origin than those in the nerve structures. They are most marked in the corium under the papillae and affect especially the prepuce and nymphae, being found in the clitoris only in the glands under the epithelium and much less marked than in the labia minora. In the corium of the latter are seen many minute vessels with abundant exudation of leucocytes into the perivascular lymphatics; while in many parts the subepithelial tissue is a mass of leucocytes and proliferating connective-tissue corpuscles. Webster notes that "These changes are most marked in the hypertrophied nymphae. They are distinct from the chronic fibrosis affecting the nervous structures and are no doubt due to long-continued irritation and scratching. They affect chiefly the superficial parts, viz., the prepuce and nymphae, the nerve fibrosis being more marked in the clitoris."

No mere clinician should attempt a summary of this literature.

FOLLICLES AND PIGMENTATION

Enlarged sebaceous glands showing as flat or elevated, white, whitish-yellow, or yellowish spots were distinctive in 15 per cent or more of my cases. On the inner face of the labia majora, above the clitoris, or alongside it, the hypertrophied follicles project like gooseflesh but with a polished surface (Figs. 85; 97:B). A much more distinctive character is the enlargement of follicles that show as close-set, large, flat, yellowish-white spots, on the inner face of the labia minora or, laterally, outside the fourchette. These are seen chiefly where inelastic, unwrinkled thickening of the labia has occurred.

Ballantyne found, in a large wrinkled labium minus "an enormous number" of sebaceous glands each made up of several oblong alveoli. Here the connective-tissue stroma and epithelial layers were increased, but not the blood vessels. In a second case there were few sebaceous glands, no adenoid tissue of Carrard, but an increase in the nerve ends.

Enlargement of the labia occurs in the blonde to the same degree, but perhaps less often than in the brunette. Large, blue veins are more readily identified than in darker skins. The follicles are white and more conspicuous in blondes. There is little pigmentation in true, i.e. the "negative" or "washed" blondes, as distinguished from the "positive" or "tawny" blonde. Yet once, on huge nymphae in such a patient the whole was of the deepest blue-black tint (Fig. 88).

CHANGES IN PREPUCE

The hood over the clitoris may or may not take part in the enlargement of the labia minora, or it alone may undergo characteristic alteration. In frequency it ranks only second to enlargement of the nymphae, being present in 52 per cent of these cases. This alteration is the same in character and in significance as that of the minora. Thickening and wrinkling into folds or even into many layers, with or without pigment, is usually symmetrical but may be one-sided, or involve only a single portion. A foreskin may lie in three thick folds, each 6 or 8 mm. in transverse diameter (Figs. 84; 100).

Increase in size of the prepuce is independent of and to be distinguished from increase in the clitoris. A minute clitoris with a large hood is not uncommon, and conversely a long organ beneath the hood may give the impression of thickening of its cover (Fig. 78:S7). In infants this preputial enlargement is the most frequent and characteristic alteration from friction (Fig. 79). Among young children, observers are agreed that masturbation is more often found in girls (See Ellis, 1933).

The entire absence of prepuce was noted four times, without history of circumcision, each case showing hypertrophies of other parts (Fig. 85, top).

Accumulations beneath the prepuce may be removed easily by drawing back the hood unless they are deeply pocketed at the apex. Under the adherent foreskin the smegma is sometimes found in tiny, hard pellets, white and glistening, firmly adherent (Figs. 77a, bottom; 79:S408; 86:S27; 158, top). As pointed out by Stieve, there are no glands hereabouts so that smegma is hardened epithelium, not secretion, as it is often called.

ACCESSORY LABIA OR BRIDGES

Starting from the middle of the outer aspect of a labium minus, a wrinkled and pigmented fold is sometimes seen to cross the gully between the two labia to the majus, on the inner surface of which it loses itself in its course diagonally forward and outward or directly forward. It may be one-sided or double. It may be located only on the inner aspect of the labium majus, paralleling or duplicating the labium minus. As the patient lies on her back with the thighs apart, it usually hangs perpendicular, running straight downward to the most prominent part of the curtain of the enlarged labium minus (Figs. 83; 84; 101). These folds are found in 8 per cent of my cases, left-sided enlargement preponderating a little, as in the cases of the minora perhaps because of the use of the right hand. Bergh found them in one per cent of 2,981 women, 10 on both sides, 6 on the right, 13 on the left. Running, not diagonally, but at right angles (sic) to the nymphae, he counted 8 double and 25 left-sided ridges.

Jayle has excellent pictures.

CHANGES IN FOURCHETTE AND PERINEUM

The fourchette is often altered as a continuation of the labia minora, with the same characters of wrinkling and pigmentation being found in 10 per cent of the list (Figs. 83:S707; 93:A, B, D; 94D; 100). It alone may be affected or the corrugated fourchette may constitute the chief hypertrophy. Then the closed labia majora show nothing protruding but the puckered fourchette (Fig. 80). When drawn open a "rear crescent" of parallel folds is found, its concavity facing forward. A rugose, many-folded or puckered and elevated band may cross the skin surface of the perineal body in any direction and this may run to the anus (5 per cent). In the most pronounced cases two parallel bands run across the perineum longitudinally, as continuations of the enlarged nymphae, backward to the anus. Piles and skin tabs about the anus are a frequent accompaniment. Deep pigmentation about the anus accompanies the other pigment deposits. In these cases which show increase in elastic fiber in the perineum and fourchette, injury in labor rarely occurs.

Blacker studied the location of the fourchette in 348 women who had suffered no injury to that structure. In fifty-two, or 15 per cent, he found it was formed by the united posterior extremities of the labia minora, in the others it was a fold of skin apparently uniting the posterior extremities of the labia majora. In virgins a third showed nymphae and fourchette continuous. Of the total, 19 were hypertrophied, or 5 per cent. I draw attention to the fact that any symmetric hypertrophy of the nymphae very commonly develops the fourchette.

Bergh found the perineum corrugated in 188 out of 2,200 prostitutes that is, in 9 per cent. In 120 the lines were parallel and symmetric, 39 were on the left only, 26 on the right only. The fourchette continued across between the labia in 43 per cent.

Jayle's drawings are representative.

CHANGES IN THE HYMEN

The average normal virgin hymen is puckered, sensitive, small in its opening and relatively inelastic. That is, if the patient has not used the douche nozzle, has never been under examination and treatment, the hymen has never been handled, the average forefinger will pass with difficulty or not at all. If the finger passes to the second or third phalanx, a sharp tight edge will be felt and pain will be complained of (Figs. 59; 73; 89). Under careful and gradual dilatation, brought about by regular vaginal douching, or careful gynecological treatment with a small speculum, or manualization, no tear occurs, but the elastic quality increases, sometimes phenomenally, and sensitiveness diminishes and disappears (Fig. 99, bottom, left).

If the stretching is not too great or too long continued the former characters again return. If either of the three causes of dilatation are persistent the sharpness of edge disappears, the tenderness lessens and in proportion to the duration and extent of these processes resiliency and callousness are found. Intact hymens without notches or nicks that stretch to a six to nine inch circumference, through which a widely opened Cusco speculum can be readily drawn out, or the closed fist passed in, were seen in nulliparous women in 15 instances (Figs. 58; 59; 100). Some of these had been under treatment of other physicians but such a degree of stretching could not be credited to a speculum.

Insensitiveness of the whole pelvic floor is striking in advanced cases. In the most extreme cases (dilatable to three inch diameter or over) the hymenal orifice may or may not gape (Figs. 59; 100:S339:S53). This depends on the tonicity of the pelvic floor muscles. In certain women who assert that they have never had intercourse and who show no evidence of childbearing, the vaginal opening will gape widely, the untorn hymen hang out and the posterior vaginal wall protrude or at least pouch plainly through the open hymen, a flat continuation, on its anterior or inner side, of the posterior vaginal wall (Fig. 99). In other cases the hymen seems partly effaced and worn away, as it were.

The earliest full series of hymen pictures are those of Hofmann. His specimens show hymens of the newly born with one or more notches running nearly or quite to the base of the membrane. The extensive collection in Jayle's "Gynécologie: l'Anatomie Morphologique" is so carefully drawn and shows such great variety that this Atlas finds it unnecessary to duplicate variants and omits the rather numerous double hymens, or tabbed hymens and others. Jayle also has a unique collection of pictures of the locations of vestibular glands, though he shows scant interest in urethral glands.

THE MEATUS AND URETHRA

The urinary meatus varies in shape and is either triangular, crescentic, a cross or a longitudinal slit. More usually it is triangular with the sides of the triangle curving inward and the apex toward the clitoris. The posterior side frequently bears a notch or dip at its center (Fig. 90). On this rear side near each outer angle, or just within it, the openings of the urethral, or Skene's, glands are usually found, though their location varies considerably. At these lower outer angles, in our cases of vulvar hypertrophy, a curious pair of flaps or tabs was noted in about 20 per cent of the list and first described by me (1902).

"Urethral labia" and "urethral hymen." At times pyramidal and broad of base, merging into the anterior fold of the hymen on the rear or vaginal side; at times thick or crescentic, and again pointed or earlike, these protrusions lie against the sides of the meatus, or point toward the clitoris, and it is only by drawing the hymen open, or the meatus well apart, that their shape is developed. Then they project 1, 2 or even 5 mm. (Fig. 90). I have seen protrusions 7 mm. thick at the base, 10 mm. in height, looking almost like tiny nymphae.

Just within, or at times without, the apex of each flap the opening of an urethral gland is found. A filiform bougie or fine silver probe develops the fact that the gland is much longer than normal, often running downward and backward into the anterior column of the vagina (Figs. 88; 90:E). Several gland openings may be seen. This anterior end of the hymen may be the only part of that structure which has undergone alteration; its folds are thick and a prominent ridge connects directly with the meatus flaps as shown in the figure.

Two diverging ridges sometimes run forward from the meatus (Figs. 79, Jayle;86, top; 118). These are hypertrophies and not the *bride masculine* of Pozzi, nor the *bride vertical* of de Sinéty. They are well shown in the cut in Cloquet's "Anatomie," Fig. C. Schüller has given their anatomy best.

The urethral gland in section is shown in Figure 88. Its diameter is said by Schüller to be 1 mm. at the mouth, 2 mm. deeper in; the depth from 0.5 to 2.5 cm., with 2 cm. a common figure.

Whatever causes the introitus to gape throws the meatus wide open and exposes to view and to contact, to friction and to "insult," the prominent openings of the urethral glands. Therefore these outspread wings are crowded against the sharp lower edge of the subpubic ligament, to and fro with much force, either in coitus or with manipulation. Indeed, the meatus is largely endowed with special sensibility. When a vulva of moderate size is distended by a Sims speculum, large or small, the urethral lips open widely.

Far from being natural barriers for covering in the urethra, as Kelly held in 1903, these prominences when large are the result of long friction. Hypertrophy about the meatus occurs only when there are hypertrophies of the labia minora. They are to be detected in 20 per cent of such cases, and are to be distinguished from swellings caused by inflammation or infection. The V-shaped ridges of the vestibule, running up from the meatus to end beneath the clitoris are found in about half the cases with urethral lips.

As to their anatomic geography, these urethral labia seem to me to be the hypertrophied anterior part of the hymen. When the hymen is thickened and pouting, whether tiny in opening or wide, the anterior folds of it can be seen to be continuous with the lips of the meatus. The meatus hypertrophies seem clearly explained by Pozzi's statement of the origin of the hymen, which is opposed to the commonly accepted theory advanced, especially by Henle and Budin:

"The development of the hymen is of late occurrence in the embryo. Not until the nineteenth week do we see appear a sort of fold about the uterovaginal conduit at the anterior orifice of the vaginal canal, which is formed above by the fusion of Müller's ducts, and below by the vestibular canal, the latter a vestige of the urogenital sinus. At first there are two linear elevations, which advance toward the median line until they meet. For the time being the hymen is a double organ and the little band which it forms on each side of the urogenital fissure is continued beyond the opening of the urethra up toward the base of the clitoris. When the vulvar and urethral orifices are formed, it frames both of these openings, forming about the first-named the collarette of the hymen and about the latter an annular ridge, very conspicuous in children, continuous below with the hymen, and above with a median prominence, which is analogous to the frenum of masculine hypospadias. Thus constituted, the hymenal apparatus is composed of three portions:

"(1) Hymen; (2) the annular prominence which surrounds the urinary meatus, sometimes so pronounced as to merit the name urethral hymen [shown in my case in Figure 90, top right]; and (3) the *bride masculine* or frenum of the vestibule. Anomalies of development may affect these three segments, and their actual identity, hitherto unsuspected, enables us to explain readily a number of facts" (Pozzi, *2*).

Three forms of alteration at the meatus have been noted: *dilatability*, *dilatation with hypertrophy and dilatation without hypertrophy* (Figs. 87; 90:G). Varicosity, prolapse of the mucous lining of the urethra or caruncle may be present. Inflammation, catarrh or suppuration in the urethral glands is not infrequent (Fig. 90:F). The openings may gape and be reddened and tender.

In advanced cases of the urethral habit of masturbation the meatus will admit the tip of the little finger for a short distance and without discomfort. In others, the opening gapes, the orifice of the Skene glands marking the outer angles (Fig. 87). In pronounced instances, the flaps stand out on each side of a gaping slit. In all a complete lack of sensitiveness within the meatus for at least a half inch is notable. The Kelly cystoscope No. 14 goes in through the lower half with ease. In two cases in my records incontinence was present; in both the vulva and vagina had evidently been exhausted as locations for producing sensation, with the urethra the only new surface remaining.

Urethra. The average urethra readily dilates to 8 mm. (⅜ inch), equal to No. 8 of the French scale. As to the frequency of large calibered urethras in gynecologic and obstetric practice, my case records of the last 4,700 patients may give evidence. I make full entries, with diagrams or drawings, and have been especially interested because I was a pupil of and illustrator for Skene when he was discovering the urethral glands.

There are, in these records, descriptions of just two urethras that admitted the thumb and would have admitted the flexible pessaries found in the bladder by Rudnick, Lohnstein and Barnsby (R. L. D., 1930). One patient was incontinent until I operated on her; then, by digital dilation, she restretched the canal in a few months to readmit the thumb (Figs. 87:S423A and 90:G). There were eight instances of urethras readily dilating to 14 F. and nineteen to 18 F. but many of the auto-dilations went no farther than the triangular ligament.

Among dilatable urethras such as these 23, I have not seen any in which the patient failed to report urethral friction, as in twenty-one; or else show full signs of manualization.

Loumeau, in his witty story of the thimble that slipped into the bladder "at the end of the ten years of use," says that the meatus looked like a urethral vulva (Fig. 87, top right and left). Bergh found 6 per cent of his prostitutes with a meatus admitting the tip of the little finger.

I am aware that urologists see some distensible urethral canals, and that of old the surgeon's finger was sometimes passed into the bladder, and that this resulted in incontinence in only about a fourth of the cases. Stoeckel among others believes that there are congenitally wide canals.

If the figures given here are fair samples, the danger of passing a pessary into the bladder or anything but a small douche nozzle seems negligible. But even among those with a visibly large meatus, such danger affects only one in thirteen; among those given to urethral friction, one in two hundred, and among gynecologic-obstetric patients, one in two thousand. This is an answer to Rudnick's apprehension about the general risk of introducing a compressible contraceptive pessary into the bladder.

PELVIC FLOOR MUSCLES

One of the early evidences of autosexuality is hypertrophy of the levator, as shown by some degree of vaginismus, or increased irritability. In nearly 40 per cent of all cases noted of any hypertrophies about the vulva there was an increased vigor of the levator.

The levator ani seen on the dissecting table is an entirely different muscle from the levator alive. The first is a thin layer of loose-lying fibers, hard to isolate in dissection. The second is relaxed, ready for action, and in the upright posture steadies the rear half of the pelvic floor. Some women are unable to relax and contract the levator voluntarily when standing.

An inch within the hymen, to right and left of the vagina, one finds a ribbon with a border as thick as a pencil, *i.e.*, the inner edge of the pubo-coccygeal part of the fan (Fig. 135). In cases of hypertrophy this edge is hard and thick and swells inward in a bow shape, like the center of any other contracting muscle. One side is usually more developed than the other, the left being usually the larger. Indeed the group of pelvic-floor muscles, as they contract, seem almost to cross the pelvic outlet transversely, leaving a small triangular gap under the pubic arch (Figs. 135; 136).

CHANGES IN VAGINA

There seem to be two characters of lining in a greatly enlarged vagina. Either the number and prominence of the rugose folds are notably increased or else the wall is flabby and smooth (Figs. 55; 94:A and D). The voluminous bag presents gross foldings as though the patient had recently been delivered. One of these folds usually falls transversely at or below the cervix level on the posterior wall. One or two anterior columns may be prominent (Fig. 55). Jayle pictures these fully. In the first group the whole mucous membrane gives the impression of increased thickness to the touch. Its exhausted sensibility in certain instances is shown by the powerful pressure to which it is subjected and by the use of rough implements like kindling wood, that cause bleeding; or of great size, as a vinegar cruet or a vichy glass, all of which the writer has had to extract whole or in pieces. The posterior wall, even in the nullipara, may pouch partly outward through the distended hymen or be level and continuous with the protruding level posterior lip of the hymen (Fig. 99).

EFFECT ON UTERUS

As described earlier, the imparous uterus relaxes and contracts at more or less regular intervals; changing in form, in outline, in density or consistence during palpation (Figs. 31; 38; 39). In the cases we are studying and in the active years of the autosexual habit these developments are believed to be more distinctive than in any other condition save early pregnancy.

VULVAR HYPERTROPHY AND LABOR INJURY

The individual with large labia and their concomitants appears to me to be much less liable to lacerations and overstretching of the pelvic floor than one without such findings; on this matter a considerable series of relevant records awaits analysis. Such safety is easy to understand where graduated self-massage has been vaginal. A hymen that looks virgin and yet admits most of the male hand held as a cone might raise expectation of freedom from tears in careful delivery—might even pre-suppose absence of any nick whatever in the hymen, from the passage of the largest diameter of the baby's head (Figs. 65; 100). In the distensibility chart and picture (Figs. 59; 73) two of the large circles represent hymens which look virginally narrow before distension.

But it is far from clear why marked labial enlargements alone, without vaginal increase in elasticity and dimension, should endow deeper structures and inner passages with yielding qualities and relative immunity. The hypertrophy which does this seems to be not the "brawny" or smooth leather or glandular varieties (Fig. 85), but the elastic corrugated kind, and this during its height, that is, during deep wrinkling rather than the drooping curtain stage, or during the time of elastic fibre and unstriped muscle fibre increase, rather than in the later time when there is less elastic connective tissue.

The theory may be tentatively advanced that vulvar enlargements mean increased blood supply and growth in the deeper structures so that when the normal thickening and relaxing of late pregnancy (Fig. 64) prepares the soft parts for easier stretching, the changes occur in tissues already adaptable, or favorably altered to foster plasticity. Massage of the pelvic floor late in pregnancy and during labor (both done formerly by Edgar and Dickinson) seem to confirm these findings.

BREAST CHANGES OF EROTICISM

Though mentioned in French literature, no report of the mammary as the chief or only method of excitation is known to the writer. Marked mammary enlargement and pigmentation with developments about the nipple resembling pregnancy, are not rare among nulliparous women given to autosexual practice (Figs. 103, 104). They were noted in about 10 per cent of my series but were not always looked for, so that this percentage is not trustworthy. The nipple is less often erectile than the follicles of Montgomery. Elevation of the primary areola with rose coloration and a pronounced secondary areola may occur in the virgin, even in the blonde, and wrinkling of the primary areola may be conspicuous in erotic women; the veins are occasionally distinct. Models with breast showing a sort of total erection are said to be in demand by artists of "erotica."

At every *menstrual period* the mammary glands are stimulated by the corpus luteum, causing epithelial increase and distension of ducts, nodularity and often tenderness or pain (Fig. 43). Hyperplasia of pericanalicular and periacinous connective tissue and new acini (Fig. 49) may develop and occasionally discrete tumors that are fibroadenomas. Cheatle, to indicate its physiological nature, calls the condition "mazoplasia." H. C. Taylor, Jr., prefers "chronic mastitis." In patients suffering from "painful breasts" the overactive corpus luteum dominates the ovarian metabolism, lessening menstruation and exciting an estrus-inhibiting influence. There is relief from use of ovarian residue by the mouth, according to Cutler.

A physiological pre-menstrual breast hypertrophy occurs, according to Rosenburg, like that in early pregnancy and disappears in ten days. Polano thinks the individual variations are very great.

During *pregnancy* the normal changes are pigmentation, erectility and wrinkling in nipple and areola as shown in Figure 103. Enlargement of the breast occurs with secretion of milk after the third month. Darkening occurs most distinctly in the brunette. The chief new formation is in the outer edge of the circle, the secondary areola, with its washed out spots (Fig. 104). The primary areola develops new elevations or any follicles of Montgomery already present show increase in size. Traction or cold water bring about increased projection of the nipple and sometimes constriction at its base, with some fine wrinkling of its surface while at the same time the primary areola puckers and becomes smaller in area and any follicles stand out much more distinctly.

Any ridges induced are either circular or, run in part in lines pointing *toward the navel* from either side. In a few cases the primary areola shows no corrugation but only lessening of area or rising of the follicles or both together. The elevated areola, the breast on a breast of some races, increases in prominence.

In some women, especially blondes, little or no darkening develops during pregnancy. The secondary areola may be hardly noticeable or it may spread over a wide circle. Shrinkage of the areola may be to one-half its previous diameter; projection of the nipple may be to twice its previous height.

After nursing is over, all these changes retrogress and at times nearly disappear, but usually some pigmentation and some degree of response to traction on the nipple and to cold remain for years. The gland edges usually may be identified thereafter in a woman who has no undue amount of firm fat in the breasts.

In certain parous women the reactions are prone to remain complete for many years after delivery, this, according to their own testimony being due to regular nipple caress (Fig. 104). In those who have never been pregnant, any or all of the alterations described may be found in the nipple and areola. Among the *virgin* or the nonparous I have evidence that such changes are found in those with strong erotic endowment or active erotic training, and they are stated by some to be due to repeated excitation of the nipple area.

Cold, as in a long sea bath, can excite the reaction most completely, albeit this is a non-erotic excitation.

I think that in marked cases of areolar excitability there may be, initially or continuously, caress as cause; or the cause may be merely a sufficiently strong reflex. Association with large labia is very frequent. I am further under the impression, though with little evidence extracted from the histories, that some of these changes may occur as a reflex in women with chronic intrapelvic irritations like fibroids or ovarian tumors, without necessarily being associated with mammary excitation or frequent genital stimulation. Concurrent breast and uterine changes in mice, are reported in connection with a cancer study by Dr. Gilroy at Edinburgh University.

The more common of the strongly pleasurable sensations connected with the breast in these reports is generalized response produced by pressure in hugging, by lifting the whole breast and by tender surface caress. The greatest intensity of excitation, however, has the nipple and its neighborhood for its site. The evidence of active and frequent arousing of this feeling may be found in the swift and striking contraction of the areola, which is quite as noticeable as erection of the nipple. Indeed the areola seems a better gauge of habitual local excitation than the nipple itself, save where a given nipple is nearly flat when relaxed, and swiftly becomes very prominent when contracted.

The smooth muscle fibres are laid down in orderly multiple interlacing bundles and form a layer about 2 mm. in thickness, lying in the cutis under the corium surrounding the nipple in a circle. They are fewer along the edges.

These records give full data in 21 histories with pronounced anatomical excitabilities of nipple and areola in virgins or in women many years after pregnancy. Of these, 13 exhibit advanced types of vulvar hypertrophies, and 12 of the 13 state that active feeling in orgasm is all located in the vulvar region, not in the vagina; while in 7 others response is chiefly vaginal during its full vigor. In other words, 19 of 21 say they are strong in erotic climax and 2 do not report on this point. From nipple caress with lips or suction, two can secure full orgasm, some others think they might and nine come near orgasm (Fig. 104). Four said no marked effect on the genital region came from any procedure involving breast or nipple. The contractions in these four were only moderately in evidence. The more marked the areolar response the more active was orgasm or near-orgasm. One woman, normal in coital orgasm, received quite as much stimulus through the nipple as by vulvar touch; two others had frequent orgasms in nursing, one of them having to abandon nursing in consequence.

The alterations are as follows: marked corrugation of the areola in 13 of the 21, and pronounced lessening of its area in the remainder. Eleven show ridges running diagonally inward at the lower end, toward the navel. This may give the ridged areola the shape of a lozenge or rectangle in the erotic, though this was not noted in the pregnant. The diagonal crinkle is usually combined to a greater or in lesser degree with circular ridges, and this was marked in five instances. But two of the series are solely circular, while two of the lesser wrinklings run level. The right side is distinctly more pronounced in its ridges than its fellow in seven examples, even in the three cases where the less pronounced contraction goes with greater excitability. In other words the right side, in this small series, contracts most and the left has greater responsiveness. The breast most caressed may show most signs. Ridges previously absent can develop within two months or in well marked form within three months of marriage.

The relation to a condition carelessly called "chronic mastitis" seems definite. There are irregular sharp edges for both glands as well as lumpiness; there are changes in shape and consistency, particularly at the midmonth or before the period. Marked changes in outline and nodules are recorded as tracings taken at three month intervals, some cases having been traced for several years (Fig. 49).

As a summary one may offer the idea that when found apart from pregnancy, outstanding anatomical response in the areola denotes active sexual excitability.

SUMMARY OF EROTIC CHANGES

To summarize, I record among 367 histories the following instances of vulvar and breast changes following or accompanying sexual experience of various sorts:

	Per Hundred Cases
Labia minora hypertrophied	65
One side only, indifferently right or left	12
Prepuce adherent	27
Prepuce enlarged	52
Fourchette (10) or perineum (5), corrugated and pigmented	15
Clitoris enlarged	10
Accessory labia or bridges	8
Follicles conspicuous	11
Veins prominent	22

	Per Hundred Cases
Alterations at the meatus (estimated)	20
Pronounced vaginal relaxation and hypertrophy	7
Levator strongly developed	40
Breast changes (incomplete entries)	10

VULVAS OF PROSTITUTES

The question sometimes arises as to whether there is any diagnostic anatomical hallmark of the professional prostitute, or whether she has a special type of vulva. Although my European observations in 1926 were made in connection with queries concerning diagnosis and treatment of gonorrhea, and subsequent sterility, some notes are presented here for their bearing on the question of vulvar types.

Among some 200 registered women seen during their examination by the police doctor, or by the University professor to whom suspected or infected cases were referred, I made rather full entries in sixty-seven instances in three cities, including Florence, nine; Vienna, twenty-six; and Berlin, thirty-three cases. For Paris and Constantinople I have no notes, and nowhere made sketches.

In the whole group, there were only four women with small external genitals showing no external hypertrophies. Gaping vulvas were not seen except for two torn pelvic floors. Indeed muscular support seemed particularly good. Pronounced enlargement of the labia minora with characteristic cockscomb corrugation was present in almost all, and conspicuous size was noted in eighteen instances (Fig. 83). In six women of forty-five or older, cockscombs which had formerly been large showed atrophies (Fig. 82) and 5 others at these ages exhibited fine-laid wrinkling of big labia. The clitoris was large in only 7 cases, that is, in about 10 per cent (the same proportion as in my private cases). The coital funnel at its hymen-fourchette section exhibited what I have called the "worn vulva," a typical smoothed, polished look posteriorly, with the outrolled hymen showing faint longitudinal ridges, and its rear edge thinned and almost eliminated or quite ironed out (Fig. 99). The generous elastic distensibility produced by vigorous or frequent entry was always present, although not more than one in six had borne children. One very distensible hymen was noted as unnicked. Meatus tabs occurred fairly often. Vaginal findings did not indicate greater prevalence of smooth as compared with rugose surfaces. Among breast signs, in 23 cases noted the untouched areola showed active wrinkling in 16, while of the 17 cases in which nipples were recorded 12 became prominently erect by touch of the woman's finger.

Only one in thirteen could have passed for a woman who was not having frequent sexual relations. Vulvar hypertrophies continued in five-sixths of these women who were having frequent intercourse, and at ages over thirty. Of 37 whose age was noted, 14 were forty and over; 26 thirty or more; 32 over twenty-five, with only 5 younger than twenty-five. This age incidence agrees with the reports of Hammer, Moraglia, Charpy, and Bergh.

Bergh's Findings. My findings may be compared profitably with those of Bergh in his classic study of the external genitalia of nearly 3,000 young women referred to him during his thirty year service as Chief of the Female Venereal Services in Copenhagen. These women were nearly all between twenty and thirty and were all clandestine prostitutes. In 1926 I had the privilege of inspecting his records and sketches.

In a series of 2,200 the labia majora were in apposition in 725 instances, that is, a third had little or no labial or preputial enlargement. Of all 648 had had children, and 1,552 were nulliparous. Every parous woman had nymphae projecting and 46 per cent of imparous women showed protruding hypertrophied nymphae. Of the 1,475 instances in which either prepuce or labia minora showed in the rima pudendi, in 141 the prepuce alone projected, in 60 the nymphae alone and 1,275 both showed. In only 18, and these very young, were the labia majora so defectively developed that the minora would show from this cause. Among his cases left-sided enlargement predominated over right-sided.

In another list of Bergh's the labia minora were notably large in 12 per cent of 2,981 cases, small in 8 per cent, unequal in 10 per cent, and continuous across the fourchette in 43 per cent though the fourchette was hypertrophied in only 5.5 per cent. Bergh's own sketches should be studied and the best examples published together with many of his valuable case histories.

The answer to our question therefore seems to be that while there is no appearance of the vulva which can justly be termed peculiar to the prostitutes, these women are prone to show more than the normal amount of the changes associated with active sexual experience, whether autosexual or heterosexual, especially: hypertrophy, distensibility, freedom from injury in labor, areolar excitability, and particularly the worn hymen.

AUTOSEXUALITY IN WOMEN

Cases of autosexual experience in women may be grouped as mental, mammary, vulvar, vaginal and urethral. Any progression or combination is possible. The first kind, expressed in the form of dreams during sleep or phantasy by day, with or without orgasm, may develop no physical sign to point toward the mental state. The third shows itself in the infant in hypertrophy of the prepuce with or without pigmentation, and with or without enlargement of the clitoris; and in the adult by the signs enumerated in the earlier part of this chapter.

FREQUENCY

Within the past few years evidence has become available for the first time from women of high grade mentality and socially normal, in the studies by Katharine B. Davis, Gilbert V. Hamilton, and Dickinson and Beam. Summarized briefly without fine distinctions or details, the reports as to frequency of experience are as follows:

Dr. Davis secured 1,183 replies to a questionnaire sent to unmarried college graduates, and of these *two-thirds* report the practice at some time, one-third continuing; while of 1,000 married women, 40 per cent so reported, although the question was not stressed with the married group.

More than a third of the unmarried that started the practice stopped within a year; half carried on from ten to twenty years; while of those that continue, a third had kept on from twenty to thirty years. The practice commenced for the most part between the ages of five and eleven, 42 per cent, that is, well in advance of puberty; while nearly 60 per cent had begun before reaching sixteen (Fig. 47). The mode or peak of beginning is at the eighth year. As for orgasm, though the term was not always understood, it seems to be late in developing, since its appearance is listed, in 62 per cent of those reporting, as beginning at or after the eighteenth year.

Correlation between masturbation and health in a list that covers the third that never experimented, the third that discontinued, and the third that continue, shows a "real difference" in the way of better health among those keeping on with the practice. Moreover, there is no appreciable difference in health between those who began early and those who started after eighteen. Effects called "good" and "negative," when grouped together, give 61 per cent. Not one in ten asked anyone's advice about the habit.

As this large group of Dr. Davis represents a type of intelligent womanhood known to be busied in productive occupations, and reasonably assumed to be trained in self control, and as its admissions are probably minimal, it seems a fair inference that autosexual practice is rather average experience among women and that moderate usage may be called a normal sex experience.

Dr. Hamilton reports in his "A Research in Marriage" that *seventy-four of the hundred wives* examined by him had some experience of autosexuality at some time during their lives.

The reports on autosexual practices in the Dickinson-Beam series of 1,098 married and 1,078 single women are not precisely comparable with the Davis and Hamilton series, as they were gathered in an entirely different fashion. In the other cases there was direct question and reply; whereas with my patients the subject was discussed, as such, only in particular instances. Among 1,098 married women, the histories of 701 contained relevant data, of these only 6 had no vulvar signs and 695 had one or more signs. In discussion, 286 affirmed the sometime practice; and with 409 there was no discussion, but the vulvar signs of active practice were present in 335 and in 74 the sign of former practice. If my interpretation of vulvar signs is correct this makes a *63 per cent* total of married women observed to have had some form of autosexual experience.

Among the single group, questions on the subject were raised less frequently than among the married, although the discussions when they occurred were more intensive. Of the 1,078 total studied, 374 had no relevant entries on the subject; while of the 704 with entries, 9 were recorded as having "no signs" and in 695, vulvar signs of sometime practice were observed. The matter was discussed with 211 single patients, of whom 173 affirmed and 38 denied autosexual experience at any time.

Combining the figures from the two groups of single and married in which there were both signs and discussion, there are 497, of which *verbal reports confirmed* the *anatomical findings* in 459, or *in more than eleven cases out of twelve.*

Shall we then call autosexuality so general an experience or conduct as to be justly considered a normal provision of nature, as a stage preparatory for heterosexual response?

CHAPTER VI

MALE GENITAL ANATOMY

SOURCES: *standard bony pelvis; soft parts; testis, vas, prostate—The penis: dimensions, flaccid and erect: in art and literature; in medical works—Angle of erect penis to trunk—Anatomy of erection—Ejaculation and conception—Prepuce and circumcision—Intersex genitals.*

(FIGURES 105 TO 124)

AS WITH the woman, so with the man, the source material for anatomy of coitus and conception is fragmentary. Some of our pictures are, therefore, in the stage of preliminary notes. Where data are sufficient, standards are offered, using all anatomies and published sections, constructing new tables and observing living structures. Natural size, though it waives economical use of pages and space, is stressed again because it keeps continually in mind the actual dimensions of organs, and, combined with outline presentation, emphasizes main points and omits confusing detail, while giving opportunity for full labelling. Moreover, it gives examples for diagrams to use in teaching and in histories in operating room, clinic and office, by direct entry of the actual areas of inflammations, tumors, or places of operation, particularly as room for notes is provided. Finally such methods foster borrowing and copying by direct reproduction, in a relatively new field, where there is increasing need of thinking and planning in terms of the non-medical texts that are rapidly multiplying.

Simplification has been sought. As one instance, although the vas measures twelve inches from top of testis to ejaculatory duct, the foreshortening in each view makes its length appear less (Fig. 106). In the same figure the passages on the right side are shown moderately distended, while those on the left are nearly closed. Furthermore, the bladder is purposely suppressed, and the seminal vesicles have been drawn away from it to exhibit size and shape from front and side.

SOURCES

The proposition for the standard male pelvis is worked out from Fürst, Krause, Waldeyer, Braus, Testut and Jacob, Poirier and Charpy, Fick in Bardeleben, Rauber-Kopsch, and Tandler—not omitting Zaaijers' comparisons between fresh pelves and the same when dried.

The soft parts are from the two great French anatomies and Rouvière, from Eberth in Bardeleben, Waldeyer, Spalteholz and Corning, from Piersol and other anatomies in English.

The diameter of the thigh and the distance from mons to buttock I get from art anatomies, and they seem to run seven inches for the first and nine for the second, the shape of the buttock naturally varying with age, nutrition and posture (Figs. 105; 115).

The mons veneris in man averages, in 12 measurements post mortem, a little less than the thickness of the symphysis, the range running from one-half the thickness of the bone to one and a quarter times that diameter.

I lack material for placing the relaxed penis and the scrotum on the living, standing figure. There is agreement on length of penis, 9 to 10 cm., and on diameter, 3 cm.; on thickness of scrotal mass and on location of suspensory ligament and subpubic urethra. From top of symphysis to meatus averages 12 cm. for the median section. But only profile photographs or outlines drawn from shadows, or averages from living men can locate the external genitals for this drawing (Fig. 107). The statues and art anatomies and Stratz give few profiles of value. Schadow's Polyclete, for instance, seems to minimize size and projection. How far back the testicles hang between the thighs is not clear, even though the testicle-epididymis oval is said by Testut and Jacob to hang at an invariable angle of 45° (Fig. 111).

The left testicle in Figure 106 hangs in the scrotum in its place in relation to the penis, while the other is deployed and cut in two to display the ducts that gather the sperms after manufacture. The spermatozoa of course are out of proportion, as a single sperm measures only 40 to 60 thousandths of a millimeter. Spermatozoa are finished off and partly stored in the epididymis, with some storage in the seminal vesicles, as indicated by the reports of Belt that after the human vas has been tied in sterilization operations considerable numbers of active spermatozoa may be found in the ejaculate for two weeks.

The *bulk* of semen ejaculated is derived from the seminal vesicle but the prostate secretion furnishes some of the total and adds an important activator for the spermatozoa. Cowper's glands are seen to be small; their function is either urethral lubrication after urination or else, during preliminary sexual excitement, to render the urethra alkaline for such favorable reaction on the sperms during their passage at the subsequent emission. The numerous glands of Littré located along the urethra are to be noted as it is possible they may be the main source of mucus at the meatus during sexual excitement.

The anatomy of the male is given in very great detail in the 1930 edition of Testut and the histology is given much consideration in Eberth, Stieve, and Braus, upon all of which sources this Atlas draws freely.

The connective and elastic tissue framework of the *prostate* is rich in smooth muscle fibres. The lobules have individual ducts to the number of 15 to 30 opening onto the verumontanum. Each lobule is encircled by a circular and longitudinal layer of smooth muscle fibre which can expel the prostatic fluid in a lively and energetic fashion. The fibres are abundant, and in the dog they constitute one-seventh, in the man one-fourth of the total mass of the organ.

Testut (Ed. 1930, p. 200) points out that "The wall of the vas exhibits remarkable thickness, measuring a little more than one millimeter, while the lumen of the canal hardly attains a half millimeter." Four-fifths of the thickness of the wall is smooth muscle fibre in three longitudinal layers, the intermediate being thicker than the external or deep layer. The mucosa lies in longitudinal furrows.

From prostate to penile portion the urethral canal includes in addition to mucous membrane and smooth musculature a layer of striated muscle at the prostatic level.

Comparative Anatomy. There is large material at hand in the National Museum at Washington for a study of the comparative anatomy of the copulatory organ of mammals which might shed light on human anatomy. The vestiges of the bone in the penis of certain animals is found in the tiny prism of cartilage appearing at times in some of the lower races of men. The prickly projections around the corona of the glans of some fourfooted animals have an analogy in the minute projections dotting the same area in some men (Fig. 118).

An example of useful study of comparative anatomy is the emergence of the testicle from the abdomen to its curiously vulnerable location outside. It thus avoids a temperature that, in the higher mammals at least, arrests sperm production, and at the same time secures an arrangement for sufficient warmth in cold weather by the action of the cremaster muscle which brings it close to the body (Fig. 111). Animal experiment shows that replacing the testicle in the abdomen can put it out of business; and animal experiments demonstrate that heat tolerable to the hand, can, in a half hour, arrest sperm manufacture for weeks, thus indicating the possibility of a simple method of control of conception, as described in our Manual, Control of Conception, page 117.

THE PENIS

The pendant part of the penis hangs on the symphysis pubis by the suspensory ligament one-third of the way down from the top of the bone. Taking lines off at right angles to the axis of the symphysis, the top of the curve is found, with one-third of the series at the level of the top, one-third half way down the symphysis, one-third intermediate (Fig. 107).

DIMENSIONS FLACCID AND ERECT

Elaborate search of medical and other literature has brought to light no published series of measurements of the erect penis; nor, with one exception, do the few writers that give figures state their sources of information. I could not locate the collections of specimens or data supposed to be in such archives as those of Hyrtl of Vienna or Charpy of Toulouse when I sought them in 1926.

After a vain hunt for such measurements, both here and abroad, in libraries, and in departments of anatomy, I gave carte blanche to the most expert of our library searchers, the late Edward Preble, M.D. He reported in 1927 that in the long list of volumes consulted and the standard indexes "there is little or nothing to unearth." Thus, Rudolf Martin's "Anthropologie," although it is "exhaustive in most respects and even takes in apes" has "no allusion to measurements of the genitals of either sex. . . . . This silence seems to mean that these organs are not recognized as belonging to anthropology at all." Other specialties proved equally unrevealing, and Dr. Preble among thirty-two leading anatomies, encyclopedic surgeries and urologies, in three languages, found only nine authors who gave figures at all, and of these only one cited cases.

"The average writer is apt to repeat the statement that the organ varies greatly in size and without respect to the size of the individual. This seems to justify him in refraining from giving any figures."

Averages made up from the statements of the nine authors who give any data show the flaccid penis 10 cm. in length and 3 cm. in diameter, and 8.5 cm. in circumference (4″ x 1⅛″ x 3⅜″); and the erect penis 15.5 cm. long, 4 cm. broad and 11 cm. around (6″ x 1⅝″ x 4⅜″). These are shown in the accompanying table, and in Figure 113, together with individual variants. Length is usually measured from mons to tip of glans, and circumference about the middle of the shaft.

Measurements of Penis, Flaccid and Erect
cited by nine medical authorities)

		Length		Circumference			
			Erect	Flaccid	Erect	Flaccid	
Testut and Jacob	1914		15–16 5				
Testut (Latarjet)	1931		15 16	9			
Delbet	1901		15	9			
Waldeyer	1889	9–10	14–16	9			
Krause	1879	9–11	(21)*	—		2 7	4–4 5
Piersol	1907	8 5–10	16 5	7 5	8 3		
Loeb	1899	7 25–11 5		8–10 5			
White and Martin	1911	7 5	15 5	7 5			
Keyes	1917	6–1c	12–17	—			
Range in centimeters		6–11 5	12–21	7.5–10 5			4–4 5
Average in centimeters			15 5				4 1
Average in inches					4⅜		

* Not included in average.

The figures in Testut may have been copied by Delbet in the Poirier-Charpy volume of 1901, while Waldeyer in his six statements differs in only two instances from the preceding figures of Testut, and in those two only by a small amount. The Philadelphians, Piersol and White and Martin, give somewhat smaller dimensions. My own reports are few.

Krause (1879) reports the volume as changing in erection from 60 cc. to 278 cc. He gives the extraordinary length of 21 cm. for the erect penis, as occurring in "most cases." But unlike his treatment of general pelvic measurements he cites no cases, nor original sources. And, moreover, as he does not tell how the measurements were made, this is not included in the average, as it exceeds all other outer limits by 4 cm. or nearly 25 per cent. Vierordt (1906) cites Waldeyer and Loeb and apparently gives Krause's figures without mentioning the source.

Loeb alone gives a series of cases, and a basis for comparison, and his figures are therefore reproduced in full here, though as his interest seems to be only in the capacity of the urethra in relation to injections for gonorrhea, he gives no erect measurements (see p. 75).

Among 50 cases varying in age from seventeen-and-a-half to fifty-three, with 40 between twenty and thirty-five, and in height from 1.57 m. to 1.82 m., Loeb finds a length of penis from 7.25 cm. to 11.5 cm., and more than half between 8.5 cm. and 10.25 cm. The average is 9.5 cm. which is also the median and the mode. The circumference is the least variable, ranging from 8 cm. to 10.5 cm. and averaging 8.9 cm., the most frequent being 9 cm., with more than half between 8.75 cm. and 9.5 cm. The capacity of the urethra shows the greatest range, from 6 to 17 cc., with no grouping about the middle point. The long penises are in general narrow and the short broad, but length is greater than circumference in 29, the same in 4 and less in 17.

The table shows that there is little relation between the various measures of the penis with each other, or of any of them with body height. This latter bears out Piersol's observation that the size of the penis has less constant relation to general physical development than that of any other organ of the body.

Measurements of Penis in Fifty Cases by Heinrich Loeb (1899)

Length measured from mons to tip of glans; circumference, immediately behind glans

No.	Penis		Urethral capacity	Height	Age	No	Penis		Urethral capacity	Height	Age
	Length	Circumference					Length	Circumference			
	cm.	cm.	cc.	m.			cm	cm.	cc.	m	
1	7 25	8 00	6 50	1 62	19	26	9 50	9 00	7 75	tall	27
2	7 25	8 00	6 50	1 62	19	27	9 50	9 00	8 00	1 62	20
3	8 00	8 00	6 00	1 68	26	28	9 50	9 00	9 00	1 68	28
4	8 00	8 75	8 00	1 72	21	29	9 50	9 25	11 00	1 76	23
5	8 00	9 25	9 25	1 57	33	30	9 50	8 75	11 50	1 76	26
6	8 00	9 50	11 50	1 70	32	31	9 50	10 50	12 50	1 68	25
7	8 00	9 00	12 00	1 73	24	32	9 75	9 50	12 50	1 72	27
8	8 25	9 00	9 00	1 72	22	33	9 75	10 50	16 00	1 58	29
9	8 25	10 00	11 00	1 62	33	34	10 00	9 25	10 25	1 60	35
10	8 25	9 00	12 00	1 63	35	35	10 00	9 00	13 00	1 76	25
11	8 50	8 50	6 00	1 65	21	36	10 25	8 50	6 00	1 65	27
12	8 50	8 50	7 00	1 70	18	37	10 25	9 00	10 50	1 64	30
13	8 50	8 00	13 00	1 78	36	38	10 25	8 25	12 75	1 70	30
14	8 50	9 00	15 00	1 60	25	39	10 50	10 00	9 00	1 60	21
15	8 75	8 75	11 25	1 67	29	40	10 50	8 75	9 25	1 79	30
16	9 00	8 00	8 50	1 70	23	41	10 50	9 50	9 50	1 72	30
17	9 00	9 50	13 00	1 72	21	42	10 50	10 00	16 00	1 75	17½
18	9 00	8 50	13 00	1 67	27	43	10 75	9 25	7 50	1 80	20
19	9 00	9 50	13 00	1 68	38	44	10 75	9 00	8 50	1 75	26
20	9 00	9 50	17 00	1 58	23	45	11 00	9 00	8 00	1 75	27
21	9 25	8 50	8.00	1 68	31	46	11 00	8 75	9 25	1 75	53
22	9 25	8 50	8 50	1 72	20	47	11 00	9 00	11 00	1 72	23
23	9 25	10 00	10 50	1 82	23	48	11 00	9 00	11 75	1 78	23
24	9 25	10 50	11 00	1 69	21	49	11 00	10 00	13 50	1 82	31
25	9 50	8 50	7 00	1 69	31	50	11 50	9 00	8 00	1 77	26
Average							9 51	8 90	10 31	1 72	26

Indeed the external genitals are rather uniform in size, as I found in examining over 8,000 men, when I brought Army and Navy methods for the first time into municipal examinations for policemen and firemen (R.L.D. 1894). Each groin and testicle were palpated, and one looked for phimosis, varicocele, abnormal or undescended testicles, inguinal hernias and hemorrhoids. These men were a selected group in that any considerable deviation would have been detected by the general practitioners who, somewhat casually, examined before recommending the applicant to the Civil Service Commission.

Gyurkovechky (1897) found only three very small sets of genitals while inspecting 6,000 stripped men; and Fürbringer (1901) cites only one authenticated record of a "gigantic penis." This was in a negro who died at twenty of tuberculosis and whose penis at autopsy measured 19 cm. by 4 cm. This was extremely unusual.

DIMENSIONS IN ART

The Egyptian models found in tombs, little figures with large phalluses show, in three examples, a length of five inches, of which two are straight and one strongly curved (Fig. 114).

Pictures on vases are our chief treasure house of knowledge of the every day life of the Greeks. Copies of certain utensils shown by Vorberg, Feuchtwanger and Reichold, and Hans Licht indicate strongly how near modern dimensions are to the classic. Certain of the outlines are excluded as grotesques, in which bigness of virile member stood for vigor, or was used to excite the merriment of those direct and naked days. Some sort of scale for measurement on these pictures can be devised by comparison of the erect penis with other parts of the body of known diameter or length, as for example, the greatest diameter of the thigh, or the length of forearm or foot. These serve for estimate of length of penis; for thickness one may compare with diameter of wrist or ankle, from front or side, or of calf or upper forearm.

Now if we suppose the Greeks to have been of our stature, we can use an arbitrary gauge by figuring from the modern thigh that averages 7 inches (17.5 cm.) across at its thickest part in a man shown not to be obese, and by applying this comparison to any Greek figures which carry the penis erect. The Greek drawings show a pointed prepuce.

On this basis, among fifty-nine examples, twenty-six run between 15.5 and 18 cm. or an average of 15 cm., or six inches, the figure which is accepted as a modern average, shown in Figure 113. In fourteen of the twenty-six the length of the penis was about three-fourths the diameter of the owner's thigh 13.5 cm., or five and a quarter inches, our own lower average; and in twelve, the length equalled the thigh diameter and also checked as being half as long as the distance between elbow and beginning of fingers, namely 18 cm. or seven inches, just beyond our own upper average. There were seven of 22 cm. (8½ inches); two of less than 11 cm. (4½ inches); two of 36 cm. (14 inches); the later resembling Charpy's largest modern instance.

The *Roman* amulets and statues, except for a few grotesques, run as long as the three-quarter or full thigh diameter, as do the older Italian examples. Da Vinci's famous anatomical figure, the Venus Obversa, gives a full-thigh diameter. The curvature shown in Figure 112 is possibly idealization, if one judges by India, Greece and Japan.

The *godemiche*, the phallus of self gratification, runs about 13 or 14 inches, like some Japanese models, among the fifteen samples included in the fifty-nine specimens. Several are double ended. The straight shape or one very slightly curved is the rule, only seven showing a fairly marked curvature.

The *Japanese* represent the erect penis as straight and with glans bare. In sixty-seven half tones of coitus or foreplay published by Krauss and by Satow and Ihm, mostly from colored wood cuts, less than a fifth show any curve and at most a very slight curvature.

To famous artists or their immediate followers are accredited various series of books designed to go under the pillow of brides, or as traveling companions. There are no greater names in the "art of the transient world of daily life" than these, and they run for two hundred years from Moronobu the classic (1646–1714) through Harunobu to Utamaro the outstanding (1753–1806), from Kunisada the prolific, through Karuosai, to Hokusai of the last century.

In all other respects these products adhere to delicacy of line and care in proportion, and in all but ten of the one hundred nine in the Krauss series the figures are dressed in sumptuous garments, but all fall into the general convention of a phallus as thick as the owner's forearm or calf (Fig. 114). Excluding the gross extremes of Hokusai and guessing that the short stature Japanese will carry a 6 inch thigh, we find in these woodcuts an average length of penis of eight and a quarter inches (21 cm.) the range being from seven to ten inches (17.5 to 25 cm.) in sixteen examples; accompanied by an average diameter of three and three-quarters inches (9.5 cm.) the range being from two to five inches (5 to 12.5 cm.) in sixty instances. This is doubtless conventionalized humoresque treatment since we cannot suppose Nippon to exceed Europe by more than double the diameter. The rest of the convention is a show of great veins on the shaft and a glans always bare—suggesting a universally short prepuce or even general circumcision. While adhering to this gross deformity, the same prints from these old masters of color and action represent the vulva and scrotum of usual size.

The Jardin Parfumé, with a setting of sixteenth century *Tunis*, mentions the length of the erect penis to be from "twelve finger-breadths" or "three hand-breadths" to eight fingers or two hands. Without knowing what the Moslem hands of the period measured, and with no allowance for the exaggeration of elaborate sex tales, but translating into terms of modern hands 3½ to 2½ inches (according to Schadow) this points to lengths ranging from ten and one-half down to five inches, or from twenty-seven to thirteen centimeters.

MEASUREMENTS FOR DIAGNOSIS

The practical need has been to determine whether, with a given complaint of painful intercourse, the length or thickness of the penis of the patient's husband might be the cause of the maladjustment. In such clinical cases the wife was directed to place the fingertips firmly against the bone (the symphysis) and to mark on her wrist the tip of the glans; then to circle the penis and note the position of her fingers. She measured and wrote down the results.

Another method was to provide her with two pieces of flexible cord-like lead strips called solder wire (Fig. 59) and have her bring them back as marked line and circle. Again and again it developed that the ring that represented the husband's circumference was considerably smaller than the ring that was made by circling with wire my three fingers at the point to which they entered the wife's introitus without discomfort, nor was length of penis disproportionately great for the wife's pelvic coital diameter found as a cause. The results in these cases of dyspareunia are too meagre to report as averages; otherwise in attempts to secure a series of measurements I have had no success.

If these dimensions are worthy of investigation as one of the problems having to do with physical maladjustment in marriage, as I believe them to be, collecting of data should begin. Shall we have to turn to the demi-monde for these?

ANGLE OF ERECT PENIS TO TRUNK

I know of no data based on studies on the living that would enable one to depict an erection in its relation to the body of a man (Fig. 115). No series of photographs is known to me, even though I once sought them in Paris. The underworld and the demi-monde is likely to have such material. What is accessible consists of sculptures from India, from Greece and Rome, from Gothic times, and from pornographic drawings. Some of this is of doubtful value, like the Japanese pictures of coitus. The amulets worn to induce fertility among Mediterranean peoples, and used as votive offerings in Europe and Asia give the chief models and images of the phallus, and furnish some suggestions. It has been interesting to make tracings from such originals as those in the Museum in Naples and compare these with my tracings from the lifesize models taken out of Egyptian tombs from the Moll Collection in Berlin.

Because there is so little evidence, any data are welcomed in order that we may gather some actual anatomical facts. The tentative picture of erection (Fig. 115) shows what is estimated to be the average, first with the phallus carried in the erect posture, and second the amount of deflection which I suppose to be usual during deeper vaginal penetration. The undeflected axis of the penis shown here has been built mainly on the continuation outward of the axis of that part of the organ which is subpubic or fixed, by carrying onward the line of the cavernous body at the same angle at which the start is made (Fig. 107). The source material depends upon sections of cadavers and does not take into account any mere drawing in an anatomy unless such a drawing is said to be taken from sections or museum preparations.

The axis of the symphysis is drawn from seventeen sources (Fig. 107). The set of the penis on the symphysis is one-third of the distance below the top, because the sources show 5 at or below the top, 4 one-third below, 4 half way down. The axis of the erect penis averages 26 degrees to the horizontal, ranging from 16 to 36 degrees, to judge by 16 examples.

ANATOMY OF ERECTION

The change between flaccidity and rigidity in the penis is called by Kahn a triumph of bio-mechanism that no engineer would have thought feasible. It provides for a powerful tension that is prolonged yet not painful, by means of a perfectly balanced inrush and outflow of fluid, and it also permits semen to pass while effectively shutting off the bladder contents; furthermore, it plans for six major glands to coöperate in orderly rhythm and progression. The following description, and certain of the illustrations are drawn from Stieve (1930, p. 335):

Man has only one corpus cavernosum, a spongy body in two parts, but this double-barrelled structure has two crura which attach it to the bones of the pelvis, each short leg spread out to anchor it on a pubic ramus, the whole having the capacity to become as hard as gristle (Fig. 110:A).

The various portions behave very differently in erection. The corpus cavernosum of the *penis* increases in length but chiefly in thickness. It changes its form in that it becomes upright and, far beyond the other cavernous body, takes on a great increment in diameter; the change being particularly striking for the reason that its blood spaces are ordinarily almost entirely empty and collapsed (Figs. 122; 123).

The spaces of the corpus cavernosum of the *urethra* are, on the contrary, always somewhat filled, the contents augmenting during erection; thereby the corpus cavernosum of the urethra increases in bulk only in its inner section, in the neighborhood of the bulb (Fig. 110). Here it enlarges also markedly in thickness but in the central portion the change is chiefly in length. This is necessary because of its peculiar location in lying along the outer aspect of the arc made by the penis when erect.

The urethral corpus cavernosum during the most complete erection is still compressible. (Kahn shows the struts which hold the urethral canal patent, as pictured in Figure 120.)

The erectile tissue of the *glans* always remains soft and yielding though enlarging in every direction during erection (Figs. 122; 123). [It is to be noted that the elasticity of the glans renders entry into the cleft of the vulvar and vaginal opening easier and its relative softness prevents injury to deep parts. It also safeguards the rigid cavernous body of the penis proper from damage or its sharp point from doing damage (Fig. 110: A and C).]

The different behavior of these kinds of cavernous bodies is due to difference in structure. In the middle section of the urethral corpus cavernosum the musculature lies chiefly lengthwise, that is in the direction of greatest enlargement. In the region of the corpora cavernosa of the penis proper, in the bulb of the urethral corpus cavernosum and in the whole glans the muscle bundles run in all directions. These three parts enlarge in three dimensions and contain as much more in the way of elastic fibres as they lack in muscle fibre. The largest amount of muscular fibre and the least elastic fibre are found in the corpus cavernosum of the penis proper, and the most elastic and the least muscular content in the glans.

The spaces in the spongy structure when distended are one to three millimeters across—say four such caverns to a space the size of the blunt end of a pencil (Fig. 123).

The blood spaces of all three corpora cavernosa are in close relation with each other. Erection is conditioned in the first place by the behavior of arteries. They expand by virtue of their peculiar conditions whereby an increased blood supply is provided within a given time. By expansion the diameter of the arteries exceeds that of the veins, which suffer some constriction.

The outer covering of the corpus cavernosum, the algubinea, is two to three mm. thick when relaxed, one mm. when it becomes tense.

In the triple diagram of Kahn, shown in Figure 120, the upper section is schematic, the others partly so. The male organ is made up largely of tubes of unyielding connective tissue, their interior supported by inelastic partitions, the cavities so arranged as to be distended throughout by countless arteries, whenever under certain stimuli blood gushes into the caverns. The upper two spongy bodies lie parallel, with a lower and smaller one beneath. Through this lower cavernous body runs the urethra, the channel for semen, which must not be unduly compressed, and must be provided with ready exit for blood from its interior spaces. Kahn's description, somewhat condensed, follows:

As shown in Figure 120:I, blood flows from the supply arteries at *1*, through the caverns at *2*, *3*, and *4* from the front part of the organ, the glans, *5*, and thence streams through the great dorsal vein, *6*, *7*, and *8*, back to the body. In addition, the urethra is protected from constriction by a peculiar suspensory apparatus. From the cavernous body II (W) run numerous bundles of fibres like the spokes of a wheel, from periphery to wall of urethra. In proportion to the swelling of the cavernous body and the increasing distance of its outer wall from the urethra, III (W_1) this canal is drawn open by the fibres F^1 and so closure by mounting pressure of blood is prevented. To permit lengthwise extension of the urethra it lies when flaccid in pleats like an accordion, and so can unfold without discomfort.

The tissues of the relaxed corpora cavernosa are pressed closely together. The arteries lie in the chamber walls in sharp curves (II: (AD_1), (AD_3), (AD_4) and (AD_6)). These meanderings or elbows slow the current, and like bent rubber tubing they lie, empty during normal blood pressure. Access of blood is still further hampered because in the bends the arterial wall is greatly thickened by a bolster of cells (Zellpolster), so that recurrent corking obstructions shut off the lumen (Fig. 120 III: P_1 and P_3) (pages 51 and 53). This valvular arrangement was described in the preceding chapter, and is shown in Figure 77b.

Arteries change in tonicity readily, as we note in the skin when it turns from pallor to flushing. So in these arteries with tonicity or tension, the bolsters close the lumen-like valves so that only the least blood needed for nutrition passes. When the cramp of the vessel wall relaxes to allow the cavernous bodies to fill, the tube expands, the bolster moves away from the wall, and blood streams through the opened vessel: II(P_2) becomes III(P_2). The sharp curves are flattened out, and the caverns fill (III). It was a surprising paradox to discover that erection, or hardening, was started by a process of relaxation of spasm!

The bolsters have for their purpose not alone closure of the lumen of the artery, which sharp curvatures might have effected (Fig. 77b). Their presence is rendered possible by the branches with wide lumens. If the vessel bringing blood were small much time would be required to fill the cavernous spaces. Through a narrow tube, scant increase of flow is possible. But a stop cock in a wide tube can provide generous flow by means of a small clearance.

In contrast to the corpus cavernosum of the urethra that *must not* be overfilled the corpus cavernosum of the penis *must* be fully distended, and this is accomplished by a special valve mechanism. In general (A) and (B) have the same construction as (C). But the outflow is planned for higher inner pressure. The outer chambers of the corpus cavernosum in III R are very thin walled and are not distended from the center but by the yielding of their walls are firmly pressed against the corpus cavernosum (R_1). In these outer chambers begin the outlet veins, V. As long as the chambers are squeezed together blood cannot escape. But in order to provide for cessation of erection, emptying is made possible by building into the middle of the structure isolated veins with specially strong walls and which contain small funnels out of which blood always leaks a little. These are overflow channels like those in a photographic tank. They prevent extreme distension. At the end of erectile excitement, the tone returns in the arteries, the flow lessens, the tension goes down, the shut off lets go; the condition in R turns to that in R_4 and erection subsides (Kahn, p. 182ff.).

EJACULATION AND CONCEPTION

In Figures 140 and 141 the courses that end in the meeting of sperms and ovum are shown in reasonable proportion and relation, having been pictured thus for the first time in the author's earlier manual, "Control of Conception." The second is an antero-posterior median section of the partners; the first is a schematic diagram drawn from several planes but shown as a single plane. The latter gives a false idea of continuity of the canals of the urethra and the cervix but permits the various steps and processes to be gathered together in a single cut.

Let us follow the course of the male ejaculate. During excitement there is secretion from the urethral glands and from those of Cowper, providing the moisture or drops of clear mucus at the male meatus. The presence of live sperms at the meatus is occasional, so far as present insufficient case records show; Abraham Stone (p. 133) examining twenty-four specimens from eighteen healthy men, found them in five instances.

At orgasm spermatozoa starting from the epididymis up the vas deferens are propelled by its strong muscular coats; they get their bulky vehicle from the seminal vesicles as well as any reinforcements or "emergency ration" of spermatozoa that may be stored there and then, two or three hundred million in number, are thrown into the urethra through the ejaculatory duct (Figs. 106; 110; 142). Here the prostatic fluid is met as it comes from the several exits from this gland, opening on the verumontanum close to the 2 mm. nozzle of the ejaculatory duct. The combined mucilaginous mixture is rushed through the urethra, the penis and the meatus, to be deposited in the seminal pool, in the upper vagina (Fig. 141). This deposit is made in several jets in the space of some ten seconds.

After the penis makes its exit most of the teaspoonful of semen drains out of the vagina (Sims, p. 373). Of the spermatozoa that remain, a few travel in one to four hours, or more, up through the canal of the cervix (Figs. 140 and 141), and through the cavity of the body of the uterus out along the fallopian tube, to M, the meeting place with the ovum shown in Figures 45 and 141. The ovum has started from the ruptured follicle in the ovary, dropped into the ovarian bursa (if any) at O, entered the trumpet-shaped opening made by the fringes of the tube, to encounter the sperms, and to accept a single one (Fig. 45). The bursa is shown in Figure 40 at right side above.

Semen is a fluid that is grayish white rather than milky; upon ejaculation its consistency resembles a mucilage or thin jelly, which liquefies somewhat within three minutes after emission, later becoming sticky. When drying on linen semen produces a starch-stiff spot, a pale stain with a defined edge somewhat difficult to wash out.

The literature records relatively few observations of the *quantity* of seminal fluid ejaculated. We select 4.5 cc. or a teaspoonful, as the probable average. Voge reports isolated observations of as much as 7, 11, 23 and 31 cc. in single emissions. Two cubic centimeters is a low average. In emissions close together, it is less. He finds 9 gm. in weight equal to 10 cc. in volume.

Direction of Ejaculation. It is reasonable to suppose that seminal fluid ejaculated from the erect penis will follow the same direction as urine discharged with some force from the flaccid organ, and the anatomies bear this out in that median sections show the outer end of the urethral canal and the meatus lying in the long axis of the penis. Thus, in the last inch of the male urethra in the eighteen examples shown in Figure 109, the direction is identical with that of the erect penis, or straight ahead, in less than half, at an upturn in over a third, and with a downturn in less than a third. The upward angle is least in line with the rest of the urethra, yet the most likely direction to actually meet the external os, as discussed in the next chapter under the heading "Interlocking."

PREPUCE AND CIRCUMCISION

The skin of the shaft of the penis is furnished with sweat and sebaceous follicles and fine lanugo hairs, and is richly endowed with smooth muscle fibres. Stieve also notes that the foreskin presents circular muscular fibres in a web of elastic tissue. Neither the inner surface of the foreskin nor the surface of the glans possesses sebaceous follicles, or only in rare exceptions, says Stieve, so that smegma is not secretion but epithelial cells shed from the surfaces of foreskin and glans penis.

Presence or absence of the foreskin affects the surface of the glans penis in appearance, in dry or moist character, in sensitiveness, and it is claimed, in capacity to withhold from ejaculation until the partner has reached her climax.

At birth the prepuce is usually adherent. A few days later a fine blunt probe swiftly swept about the glans (while avoiding the frenum to prevent oozing) allows the skin to be drawn back fully. When any swelling has subsided the mother is instructed to begin drawing back the foreskin at two or three day intervals, inspecting especially the groove behind the overhang for white material. Regular retraction prevents readhesion. The lack of cleanliness and consequent inflammation tends, like adhesions, to produce frequent or persistent erection in the baby or small boy.

Retraction may be prevented by unduly small size of the opening in the prepuce or by lack of elasticity. This, if persistent, calls for circumcision in the form of a slit, or an oblique partial or a circular total removal, with or without stitching of the two free-sliding layers. The usual operation produces results that are hardly esthetic, for it often leaves a dewlap beneath.

Among early peoples it may have been found that from lack of cleansing facilities or regular attention the child with short foreskin had less bother than the one with long appendage, and therefore removal, like many another sound hygienic practice, was made a religious rite. Or it may have been found that the bared glans furnished better satisfactions than the covered glans. Another historical explanation of circumcision is that of a "sacrifice" marking dedication of the child to a god; this in turn having its origin as a modification of a castration ceremony in early phallic worship.

Of importance for sex hygiene is information on two points: first, is there more or less likelihood of autosexual excitation with the covered or the uncovered glans; and second, is there more capacity for staying power within the vagina, coupled with adequate activity, in those having a covered glans, and thus ample opportunity for the woman's orgasm? Are there differences in the nerve endings to be found by the microscope in the circumcized and uncircumcized?

On these problems many opinions have been voiced, but no series of case reports seems to be available. One hears rumors that the Jew is generally preferred to the Gentile by those who have ample opportunity to discriminate, and that this choice is due to his longer holding power. To be good evidence it must be shown that this is based not on artistry but on anatomy. Case histories are needed, and particularly of men, with long foreskins, who, though free from subpreputial irritations have been consistently quick ejaculators until circumcision, and thereafter, with the same partner, exhibited consistent long control. This is no light matter, for our most grievous male problem of maladjustment is premature emission (ejaculatio praecox) and it is only second in disastrous effect to blundering technique.

INTERSEX GENITALS

Three heretofore unpublished instances of intersex organs are given rather fully, and life-size because in the past such genitals have been pictured more or less inexpertly or obscurely small, with scale unstated (Figs. 117; 118; 119).

In Figure 117 it may be noted that the negro porter with the ovary has a free-swinging organ not bound by labia minora, unlike the individual who lacked ovarian hormone. The baby seemed to have testicles in a bifid scrotum.

The Austrian is of undetermined sex, but was known as a woman and married, being described in my case history as follows:

Mrs. A. B., 25, Austrian, poor and dull of mind, is fairly developed and in good health. There is no hair on her face, her voice is husky and her breasts and nipples are almost masculine. She never menstruated. Masturbation began at fourteen. She complains of dyspareunia but at times has some gratification in the sex-act. Measured from the summit of the pubic arch, the clitoris is 5 cm. (2 inches) long but is shrouded in a loose, thick and bulky prepuce, which produces a conical shape of the entire organ, and when lying forward nearly covers the glans. The glans is 13 mm. in transverse diameter, with the perfectly formed corona and groove of a small boy's organ without meatus, but with a shallow slit where it would be. The voluminous prepuce, studded with large follicles, is continuous on each side of and behind the clitoris as the labia minora. These bear the typical pigmented corrugations produced by long traction and end normally at the usual spot on the labia majora. The fourchette is normal. The junction of the mucous membrane and the skin is clearly defined in the usual location about the enlarged vestibule. The clitoris has little erectility and no rigidity. The meatus urinarius is 4 cm. below the clitoris when this is drawn upward and is close in front of the hymenal opening, a little to the left side. The vaginal opening is tiny, admitting one finger freely for two phalanges. There is probably a rudimentary uterus and ovaries. The patient says the clitoris began to grow large at 14, when she was given to much rubbing. It may have been developed in this way but it seems to me far more probable that it was congenitally large.

The patient was seen before the days of detection of the female sex hormone.

Now that we are classing much sex behavior formerly called perversion as physical defect or sex starvation or natural stages of preparation for full exercise of sex powers, many investigations carried out in the newer spirit of inquiry are in order. They will combine the physical diagnostic procedures of general medicine with the careful psychological methods observed in the psychiatric and penological histories which have constituted almost the only source of our information thus far.

There is much to be learned concerning the man or woman of full sex endowment by thorough study of intersex individuals of all grades. The ground to be covered involves heredity, upbringing and sex education; anatomy, including body type and genital measurements; diagnosis from sex hormones or by operation or autopsy as well as by record of sex behavior under various environments, and by long follow up.

Individuals with homosexual tendencies call for the same sort of physical study, with emphasis on details of body build, genital anatomy and sex hormone findings, which should accompany the inquiry into antecedents and surroundings and conduct.

CHAPTER VII

ANATOMY OF COITUS

Average sex life—Data on coital responses—Pulse records during coitus—Some theories on coital mechanisms: Descent of uterus; Fishmouth gasping of os; Insuck of semen; "Interlocking"; "Penis enters cervix"—Postures in coitus—Diagrams of postures—Displacement of pelvic organs—Posture and sterility—Measurements and adjustments—Muscular anatomy of dyspareunia—Injuries during coitus—Treatment of dyspareunia—Forestalling trouble.

(Figures 125 to 159)

No bodily function of human beings may challenge sex intercourse for far reaching effects from a single act, or for manifold implications based on short total time of action. In the single act new life or no life can hang on seconds. In the aggregate the sum of the activities of a twelve-month—exclusive of foreplay—commonly runs only to a hundred times five minutes, or the whole of the dark of one day; and the entire duration of climax adds up to no more than one-half minute a week or one-half hour a year.

Yet in another way the numbers having to do with this function are noteworthy, for among the fertile married couples in this country alone there are involved three million occasions, in every twenty-four hours of the year, for the exercise of a choice between pregnancy and prevention. And the mathematics of misery and happiness run to vastly higher figures than these as shown by the histories in our "Thousand Marriages." There is need therefore, whether this arithmetic of mine is right or not, for straight thinking in word and picture; and it is faced in part in this chapter. The section is the most difficult in the book in the way of gauging what one shall select to offer to the medical marriage counsellor or the clinical psychologist, with the idea that it will be of practical service.

AVERAGE SEX LIFE

A purely tentative chart of the rise and wane of sex activity in man and woman is offered in Figure 125, the height of the curve standing for intensity, the breadth for variety or frequency. It is a sketch which omits details and the many variants. The chart attempts to generalize the following items of sex behavior.

Beginning Ages. The small boy may have erections from the early days of life, depending somewhat on adhesions or accumulations beneath the prepuce or irritation in urinary tract or bowel. The prepuce is often adherent to the clitoris in babies and small girls, but this may not be noted until the child is found rubbing or squeezing the parts, or until preputial wrinkling is observed. Among the single women of the Davis series who reported on autosexual practice, genital excitation began in five per cent at the fifth year with the largest number at the eighth year, while in boys, the most common period of starting is reported to be between fourteen and sixteen, with only 20 per cent before then. The elaborate Davis questionnaire showed in the eighteenth year a secondary rise in the curve of beginnings of autosexuality. If coitus starts in youth in the male, this is the year commonly reported.

Ellis's recent volume "Psychology of Sex: A Manual for Students," has an excellent discussion of this matter in its normal aspects.

In the single woman, especially one with steady occupation, there is supposed to be a decrease in interest from about twenty-five until the secondary peak of forty to fifty arrives, when sexual consciousness, with the arousing of apprehension of the life deprived of love, and a lover, may bring the line high again.

The age of the woman at marriage is taken as two years earlier than that of the man. The rise preceding marriage is that of engagement, with sex-stir, sex play, or coitus. After marriage the peak for each partner is strongly in evidence. According to Pearl the man's upcurve culminates at thirty-five, among farmers, business men and professional groups alike and is sustained from thirty-five to forty-five. Stockard thinks that this thirty-five is merely maximum opportunity, and that, as twenty-eight is the turning point of physical vigor in athletes, it will be for sex performance.

Pearl plots the falling off in the sexual activity of the male as gradual, so that thirty and forty-five are alike and fifty-five is like twenty-five, while thereafter a steep decline is shown. I note that his feeling is kept alert if, as their financial conditions bring leisure, the husband woos his wife anew; or if he philanders or takes a mistress. In the case of the wife, pregnancies and child-care are seen to interfere with her capacity for some years after marriage. Then, as health improves and strains lessen, her second peak is reached. Here she may outdistance and outlast a husband who, at a period of maximum business responsibility, is in his turn physically below par. Her feeling is seen to run well beyond the menopause.

Both lines turn downhill as his power of erection wanes and she is slower to rouse, or less often wishful. For one or both there is need of longer and more planned foreplay if the feeling is to continue mutual and of the former type, even though intervals be longer. Here is the field of mental sex play as stimulus for balancing up the weakening partner; perhaps the place of erotic literature and theatrical performance, and genital touch play, whereby enjoyment may continue mutual up to seventy and even well beyond. Desire and response may continue thus long in the single.

Graphs of coitus under a variety of circumstances are submitted (Fig. 127). They cover the ground of several previous attempts, but take account of an elapsed time of stay of phallus in vagina (5 minutes or more) and of orgasm, lasting 12 to 15 seconds, omitted in the graphs of Krafft-Ebing, Kehrer, Adler, Sellheim, Van de Velde, and Kind and Herlinger.

DATA ON COITAL RESPONSES

The need of accurate knowledge by married persons concerning sex intercourse has been pointed out in the Dickinson-Beam analysis called "A Thousand Marriages" (p. 56). That study calls coitus an "index to marriage." If its data reinforce any one concept it is that satisfactory sexual relations are necessary to fully adjusted and successful union. As shown in Figure 127, our average couple has intercourse twice a week or oftener, with the trend leaning toward three times. The period of intromission lasts five to ten minutes, the husband's orgasm sure, the wife's doubtful. Without a positive result, the latter obtains a negative reaction of physical depression and emotional distaste. Frequency gives no clue to vigor, interest or erotic satisfaction. Once a week may be more completely satisfactory than daily or oftener. Age is not a criterion taken alone, as the sexual interest of middle-aged and older people in our series seems to exceed the tradition by which the world classifies them.

Orgasm. Both the Davis and the Dickinson-Beam studies show the better adjustment of those instructed before marriage. The most frequent complaint in our study is that the woman does not reach orgasm. In 310 cases reporting, more than a quarter has never experienced orgasm with the husband and fourteen per cent were having it only "rarely" or "not now." This is to say that of any five women, two had it, two did not, one had it "sometimes."

From the rather limited number of reports in my possession the orgasm itself is found to cover 12 to 15 seconds, infrequently 20 or more, and is occasionally multiple, especially in women, while it varies widely in intensity (Fig. 127).

The *location* of *sensation* in orgasm is vulvovaginal in the majority of women, but it is my guess that in one-third it is, under present conditions, chiefly or altogether on the outside, that is, vulvar. I believe that the vulvar proportion is even larger early in marriage. My figures show that the least frequent form is the type wherein the orgasm is accompanied by a sensation of throbbing once a second, due to rhythmic contraction and relaxation of the pelvic floor muscles, with a slower rhythm during the subsidence that averages about twenty seconds. Perception of direct contact (or absence of contact) with the cervix, and also profound consciousness of the impact of the semen, is asserted by a few women. This consciousness may be fanciful because the cervix is like the upper vagina in being poorly endowed with nerve endings. In the olden days when the cervix was often repaired without anesthesia, general or local, it was found insensitive in most instances. However, cautery treatment to a raw cervix is sometimes very painful. In this locality there are evidently wide variations in sensibility.

PULSE RECORD DURING COITUS

Thanks to the courtesy of Dr. Ernst P. Boas of Mount Sinai Hospital I am able to present a graph (Fig. 126) copied from a cardiotachometer record of a man and woman during a two hour period of excitement. These figures were taken from the original record made in 1928 and seen in 1929, and vary somewhat from the condensed transcript in the Boas book of 1932.

The preliminaries last over an hour. She has four orgasms: the first occurring five minutes after entering, with four minutes of high pulse rate; the second thirteen minutes later, with three minutes of excitement and still more intense heart action; the third after four minutes interval, very short, one-half minute or so, with still more active pulsation; the fourth three minutes later, something like the second. With her most active orgasm the pulse jumps from 123 to

156 and back to 129 inside of one-half minute. His excitement, to judge by the pulse tracings, starts actively before entry, and he reaches his first and only orgasm simultaneously with her fourth.

Thus we note a developed technique in that he is able to remain within the vagina about twenty-five minutes, awaiting complete satisfaction on her part. Both pulse rates are above 120 for twenty minutes if our copy is taken off correctly. Between orgasms her rate does not subside below his excitement phase. It will be observed that she starts at 90 and he at 102. Asleep her pulse comes down only to 78 and his to 73 more than half-an-hour after orgasm.

Subsidence of feeling with the woman has always been declared to be slower than with the man, but here the pulse would indicate that her feeling subsides more quickly than his. Even if the instruments prove to have registered too high the record is most instructive.

SOME THEORIES ON COITAL MECHANISMS

There are factors in human sex union which would hardly warrant elaborate diagram or discussion were it not that most lay authors and some medical writers descant at length on these marvels of interior activity, calling them critical in their bearing on orgasm, satisfaction, conception and contraception. The mechanisms in question, the Dramatic Five, are:

1. Excursion of cervix: either pendulum swing or mere descent.
2. Wide opening and shutting of mouth of womb.
3. Suction pump action of womb on seminal fluid.
4. Close interlocking of opening in penis with opening in uterus.
5. Actual penetration of human penis into uterus.

Present sex literature is given to acceptance of opinion without weighing data. For example, Kisch's "Sex Life of Woman" is a much quoted and well written volume that assembles a large amount of valuable material, but without bibliographical reference, and without that most essential factor, discrimination between speculation and observation. He presents no cases of his own and analyses none given by others, and cites as equally significant "authorities" of quite different calibre, as for example Marion Sims and Wernich. Sims, one of the greatest gynecologists, offers numbers of exact case records with findings stated in inches and minutes. Wernich on the other hand, who appears to have been a general practitioner, calls the recurring cramps of an aborting uterus an "erection" that comes and goes; and likewise labels the usual hardness found in the non-pregnant uterus, an "erection" which is the direct result of the examination, at every examination where it is found.

I am constrained therefore to give space to details of some of these observations in order to show the great need of new studies by qualified observers, beginning with an excellent example from Sims.

Marion Sims, our pioneer gynecologist, a man of great mental and mechanical ability, gives many records bearing on coitus in his "Uterine Surgery." "Nothing has surprised me more," he says, "than the difference in the relative condition of the uterus and vagina before and after sexual congress" (p. 362). . . . "I have over and over again examined the uterus after coition, and often in four or five minutes after it." The shortest time was "fifty to sixty seconds after" (p. 346). He usually found (p. 348), that if at his examination just before coition the uterus was in a normal position or even anteverted, after coition the upper part of the vagina was relaxed and passively holding a large quantity of semen in which the cervix was submerged; "the uterus itself seems to be fatigued," . . . "exhausted," . . . "and drops by its own gravity down toward the rectum, where it lazily sinks to the bottom of the pool of semen."

"In most women (p. 373) a considerable part of the semen passes off with the . . . separation of the sexes, while a large part remains . . . to gradually ooze away." In two patients the vagina held almost all received, "with perineum and nates dry," the quantity about 70 minims (5 cc.). He says spermatozoa never live more than twelve hours in the vaginal mucus, but in the cervix much longer. In one cervix after 40 hours he found great numbers very active and they lived six hours after removal, with note: "This was in July."

"I have frequently removed the mucus of the cervical canal immediately after intercourse . . . just a drop from the os, then a drop or two from an inch higher, with a long nozzle." "If the neck of the womb is normal with healthy mucus we shall always find spermatozoa immediately after coition." "Thus we see that they enter the cervix, as it were suddenly. . . . The cervix is pressed forcibly against the glans. . . . This forces out the contents of the canal, the parts become relaxed, the uterus suddenly returns to its normal condition, and the seminal fluid filling the vagina, necessarily rushes into the canal," as fluid would into an "India-rubber bottle," compressed with its mouth in fluid and then let go. With marked retroversion and anteversion spermatozoa were not found in the canal "because no such vacuum was produced."

"I believe," says Sims, "the cervix uteri to be shortened in the erithismal climax of coition by pressure on its long axis when its position is normal, which is impossible in any greatly abnormal position." This was written before 1866, according to the preface, but published in 1871, the same year Kristeller published his observations.

Sims asserts that with patients in the lateral (Sims) posture, with his speculum in use, he has seen a certain behavior of the vaginal wall "hundreds of times." Incidentally it may be noted that the Sims type of speculum gives a full and undistorted view of the upper vagina ballooned by air, and of the cervix, as no other proceeding can. "The posterior wall of the vagina," he says, "opposite the os, gradually contracted and corrugated, till it is brought almost in contact with the cervix, evidently by the circular bands of muscular fibres that occupy the superior portion of the vagina." This is more apt to occur in patients "alarmed," or who "manifest some degree of general nervous agitation."

This clinical observation should be checked up, for it is against this posterior vaginal wall that the external os rests. After the "levator" throb of vaginal orgasm, a rather steady contraction of this pelvic floor group of muscles usually is found, and it may be the upper and less active members of this group, the fascial and coccygeal, that can lift the upper vagina. These are the muscles supposed to forcibly extrude semen among primitive peoples. However, forcible downward straining is far more effective and this is brought about by the abdominal muscles and diaphragm.

Compare with these carefully qualified observations the following statements of varying degrees of dogmatism.

CERVIX CHANGES IN ORGASM

Kisch declares that during orgasm the uterus descends into the pelvis, the womb mouth is opened by the muscles of the uterus and a rounding of the flat outlet occurs, combined with an expulsion of the secretion of the cervical glands and sucking of a small amount of sperm into the canal where the palma plicatae present some hindrance to further passage. To him it appears highly probable that the excitement of coitus opens the otherwise closed inner mouths of the tubes.

Hofmann and Basch observed in rutting bitches descent of the cervix, opening of the os, extrusion of mucus and retraction of the os. With other observers there has been difficulty in experimental confirmation of these points in animals. Henle calls the process intermittent contraction, and Rouget declares it analogous to erection in the penis.

Litzmann (1846), in an able study of physiology, reports on a young and very erethitic woman in whom during vaginal examination the uterus suddenly took on a very upright position and dropped deeper into pelvis, the cervical lips became equal in length, the external os rounded itself, became softer and more accessible and at the same time respiration and voice betrayed highest sexual excitement.

Wernich, a practitioner of Berlin, reports, in 1872, on a very vigorous married woman of 24, three months pregnant, with severe pains. With each pain (presumably of threatened abortion) the soft cervix became long and hard, the mucous membrane staying compressible and movable on the firm base, and the process repeating itself with each examination. As "There was positively no other sign of sexual excitement," why this was called excitement is hard to see.

Wernich's other case was a 35 year old domestic who had had a child ten years earlier. He reported that the involution was good, the retroversion slight. She "held herself in check," but as the examination proceeded, showed, "with other signs of sexual excitement," marked "erection of the cervix," which, previously "soft and relaxed, stiffened into a hard body, thick as the thumb. Several times during the examination the organ returned to the non-erect state." The change did not affect corpus or fundus. He speaks later of the os gaping, but refers to no case observed. He seeks to explain the rarity of these findings by supposing that the hard cervix found at almost all gynecological examinations is one already erect from suppressed excitement (!). Wernich's paper is well written and shows study, but is so speculative as not to carry the weight given it in sex literature.

Gallicier reports that "during an application of the speculum it was granted me to confirm the following phenomena: (1) The cervix, partly opened by the two lips drawing apart in the form of a funnel or rather in the form of a pout (*cul de poule*); (2) The lips opened or approached each other more or less according to whether I pushed in or withdrew the speculum. There was no uterine malady." The woman had had one child, and was in the first month of pregnancy. He regards the action as having a bearing on aspiration during coitus. This brief description lacks an important detail, namely, presence or absence of bilateral laceration, since, with a double tear, pushing in of the speculum drags the two lips apart (Figs. 41; 54:F).

Kisch does not believe in a continuous canal between male urethra and cervix. Kristeller thought the hanging drop in the external os, the "slime string," the mucous plug, was a ladder for the spermatozoa to climb, but C. Mayer and Marion Sims retorted that this mucus was usually pathological material and a cork (Fig. 102:D).

Grohe declares that the woman knows and the man can feel the insuck (!). Lott calls the motility of the spermatozoa the main factor in entrance, and takes up animal resemblances. Kehrer, a real authority, notes the contraction of the cervix, the mucous plug being extruded to clear the way for the semen and thinks posture after coitus is important (Fig. 152). Hausmann believes entry of the penis into the os is important (!). Mayrhofer says no entry of semen into the cervix occurs unless the deposit is on the external os.

Dembo, experimenting on rabbits and several other animals, thought he found a single center for uterine contractions in the anterior vaginal wall. He claimed that he could demonstrate ganglia and electric excitation here produced uterine contractions as it did in no other part of the pelvis. Kurz produced uterine cramps in one patient by touching the upper anterior vaginal wall. Kaschkaroff objected to these statements.

Frankenhauser says the ganglia lie on either side of the cervix under the peritoneum on the vaginal vaults, where sacral nerves and sympathetic fibres cross (Fig. 128). He speaks of ganglia on the upper anterior vaginal walls and of spinal nerves direct to the vagina. Hashimoto says the ganglia lie opposite the middle of the cervix, lateral to it, and that all uterine nerves spring hence.

Kakuschkin of Saratow, basing his belief on experience with gynecological massage, declares that the locality in the sex canal, rubbing of which brings the sex act to a climax, is "manifestly" the vicinity of the sacro-iliac ligaments (Figs. 14; 16; 37:E). The more developed the ligaments, the stronger the orgasm. Drawing these ligaments apart has the special effect of excitement or orgasm even in deepest narcosis (!). The next most effective area, even in old women, is the base of the broad ligaments (Fig. 19). Naiditsch pictures ganglia clustered behind the cervix; and Testut, thick nerves in the uterosacral ligament (Fig. 22).

Labhardt has given an excellent summary of research on nerve supply to this region.

"DESCENT OF UTERUS IN ORGASM"

Another general assertion is that during sex excitement and climax the uterus descends, thrusting downward and withdrawing in a certain rhythm. The upward motion is even said by the gynecologist Van de Velde (*1*, p. 78) to be produced by backward traction of two "immensely powerful muscles"—the uterosacral ligaments.

This is a fair sample of the necessity for a scientific sex anatomy. These ligaments run from the back of the cervix to the second sacral vertebra and are mere folds of peritoneum, containing some elastic and connective tissue fibres and a few involuntary muscle fibres (Figs. 16; 17; 22; 37). Except when swollen by inflammation they are rarely thicker than the edge of a thin cloth coat cuff or as thin as thick paper folded; so that by no possibility can they behave like striped muscles, in slackening and then drawing up tensely at will, or else throbbing once a second like the pelvic floor group. As to any muscle attached to the uterus that could draw it downward in the pelvis or swing the cervix toward the vulva during coitus, such equipment is non-existent beyond the few thin involuntary fibres shown from vagina to cervix in Figure 37:C.

What *can* happen is depicted in Figure 157: case S1175, the only well defined instance of descent known to me. This patient has a vigorous husband who can maintain complete erection within the vagina for an hour, if desired. During any attempt on her part to bring on orgasm she has to set her diaphragm, strain down hard with her abdominal muscles in the same fashion as when expelling bowel contents with difficulty, such pressure driving the pelvic contents downward, whence they return by the elasticity of their supports, with some aid from contractions of the pelvic floor muscles. When asked to demonstrate such action, the cervix is found to be displaced one inch toward the vulva while at the same moment the anterior wall of the vagina shoots out an inch, producing a momentary urethrocystocele. The perineum and anus make a like excursion. Such action, actually timed, occurred seventy-four times in three and a half minutes. This may be a premarital habit carried over into marriage.

"FISHMOUTH GASPING OF OS"

Opening and shutting of the mouth of the womb during orgasm is also gospel in popular sex physiology. In that hollow muscular organ, the body of the uterus, slow rhythmic contraction and relaxation were long ago proven to be the habit of the healthy non-pregnant organ. Rubin declares these waves are too gentle to record on his revolving drum that registers tubal peristalsis, but G. Schultze sees the mercury rise 7 to 30 mm. (See section on contractions, page 28ff.) The relatively solid construction of the cervix, however, is such that in operations it takes a gynecological instrument with a long leverage or considerable force behind it to dilate the canal, even up to the diameter of a thick pencil and without laceration or incision or overnight dilation the finger cannot be made to enter the untorn os or penetrate into the cavity of the uterine body (Fig. 170). The tissues are firmer than those of the ball of the thumb. It is absurd to argue that a circle of such consistency can gape and close like a fish's mouth, or dilate in an instant from the diameter of a slate pencil to the full inch of the most quoted case record. Among well known specialists Mundé (2) alone reports the external os as opening and closing slightly during a visualized climax. I have seen this slight action once in the purplish cervix of erotism and have noted softening during examination on rare occasions.

"INSUCK OF SEMEN"

Suction pump action in orgasm is accepted behavior in lay literature. It may some day be proven to be usual, but it calls for confirmation. The mucus held within or produced for the occasion by the glands of the healthy cervix is asserted to be extruded during the peak of the climax in order to tanglefoot the sperms and then is said to be wholly dragged back through the external os. Mundé saw cervical mucus under excitement make exit in jets, and menstrual blood has been observed thus appearing, but only Talmey and Beck have recorded outroll and inroll of the lips of the cervix and outpour and insuck of secretion in repeated and striking rhythm. A swaying of the cervix in pendulum swings occurred in Talmey's external os, "just passable for an ordinary uterine sound (4 mm., ⅛ in.)," and opening "to admit the index finger" for three gasps, five times in twelve seconds; while in the Beck instance the "firm, hard" normal cervix with "the os closed so as not to admit the uterine probe without difficulty," is said to have opened to the extent of fully an inch, made five or six successive gasps, "drawing the external os into the cervix powerfully," all in twelve seconds. The three resemblances are either remarkable or suspicious.

If this is typical orgasm, then orgasms have not occurred more than a half dozen times in many millions of office examinations nor have they been noted in their wives by doctors familiar with the cervix, or else physicians have consistently hidden knowledge of such action. One who is frankly sceptical about reports like those cited above notes that the deportment of the cervix under maximal excitement has been all but omitted from substantial medical literature (Fig. 102). The coincidence of orgasm with the opportunity to observe it (and be conscious of what is happening) must be extraordinarily infrequent for the medical profession to be so ignorant or so reticent about it. In prolapse, with the cervix showing at the vulva, such action would be outstanding, and in treating the cervix through the speculum, with its perfect view of the structure shown in Figure 29, any opening and shutting or any jets of mucus could not escape observation (Figs. 41; 102).

Insuck is supposed to depend on orgasm. Orgasm is absent in the frigid. Yet in my study of a thousand office patients the frigid were not notably infertile, having the expected quota of living children, and somewhat less than the average incidence of sterility.

There is strong affirmative evidence for insuck, however, in the finding of active spermatozoa within the cervical canal a very few minutes after their ejaculation into the upper vagina. Such findings might be accounted for by aspiration or uterine peristalsis. It must be so credited unless they accord in time with the speed of progress of the swimming spermatozoon penetrating the mucous smear located on and in the external os (Fig. 102:D). Sperms travel at the rate of about a quarter of an inch (6 mm.) in two minutes in a warm and friendly medium, but may, possibly, not travel that gait until the semen has liquefied. Sperms may be inside the external os and out of reach of the vaginal douche or the cervix scrub in a couple of minutes after ejaculation. Their range of travel is shown by the conceptions that have occurred with deposit on the outside of the narrow unpenetrated hymen.

In the macacque monkey Hartman finds the cavity of the uterine body swarming with spermatozoa in less than a half minute after coitus.

Meaker believes that blockade from tenacity of mucus is the most frequent cause of sterility.

Fellner (1906) is very clear in his own mind how alternation in contraction produces aspiration of sperm:

"The nervi erigentes are on the one hand motor nerves for the longitudinal musculature of the uterus and the circular musculature of the cervix, and on the other hand inhibitory nerves for the circular musculature of the uterus and for the longitudinal musculature of the cervix (Fig. 37:C). The hypogastric nerves are on the one hand motor nerves for the circular musculature of the corpus uteri and the longitudinal musculature of the uterus and the circular muscles of the cervix. In both cases there is seen the law of crossed innervation. Therefore there is an antagonistic action upon the two parts of the organ.

"It is to be noted that part of the longitudinal fibres of the body become circular fibres in the cervix. [Bayer and Goerttler say diagonal, not circular (Figs. 35; 37:C).] The uterus stretches itself and the inhibitory fibres of the hypogastric bring on relaxation of the cervix. The barrier opens, internal os and external os gape, the cervical canal forms a hollow cavity and the road for the ingress of the sperm is cleared."

The freeing of the hypogastric impulse, says Fellner, is possibly by means of the excitation which the friction of the penis brings about in the ganglia lying in the upper part of the posterior vaginal wall. "Now when orgasm in male and female is synchronous, sperm is thrown into (*sic*) the cervix and aspirated into the cavity of the uterus because its lumen is widened in a vertical direction by the inhibitory fibres of the hypogastric working on the longitudinal muscle layer.

"Friction on the clitoris, the ecstasy organ (*Wollustorgan*), and inside the introitus liberates mechanically, and erotic feeling liberates psychically, those nerve impulses which lead, in cohabitation, to motor and vaso-motor processes which the action of the nervi erigentes would seem to control. By means of its vaso-dilator functions the vessels of the uterus, as well as the corpora cavernosa of the clitoris swell with arterial blood. At the same time the motor fibres of the nervi erigentes produce contraction of the lengthwise muscular fibres of the corpus, while the inhibitory fibres relax the circular fibres of the uterus so that the lumen of the uterine cavity lessens in its long diameter, but increases in the transverse diameter. During the first phase of cohabitation only the vasoconstrictor action of the hypogastric nerve seems to make itself felt, whereby the carrying away of the venous blood is hindered. Then when the orgasm has reached its high point the nervi erigentes are exhausted, the contraction of the longitudinal fibres of the corpus as well as the circular muscular fibres of the cervix relax, and at the same time the motor impulses of the hypogastric start, the circular layers of the corpus contract. Therefore, closing one and opening the other are simultaneous activities; the corpus contracts and closes as the cervix opens, then the cervix opens as the corpus contracts and a see-saw occurs." Is this only one gasp or several?

"INTERLOCKING"

In coitus the canal of the penis and the canal of the uterus are frequently said to become one continuous conduit, the two canals along an identical axis, the urinary meatus fast against the external os, and the semen being thus injected directly into the womb (Fig. 146). This maneuver is then coupled with sterility by declaring that lack of interlocking (or even missing the center of the target) is a chief cause of failure of conception.

Now our outline (Fig. 142) shows the best diagrammatic estimate one can make of the happenings in coitus until the time when the fluoroscope or X-ray film exhibit actuality. In a patient with a normally poised uterus, when one looks into a test tube of the same size as the phallus passed into the vagina, one sees its tip meet a cervix that does not point toward it (Figs. 56; 67), and then slip past the cervix and dip into a pocket beyond. Such action is shown in Figures 142 and 145. Thus the two canals lie at less than a right angle with each other (Fig. 50) indeed at an angle rather acute, say 70 degrees with half penetration, and at 40 degrees at full penetration. In full penetration the delivery of the semen overshoots the os. In the to-and-fro thrusting of coitus the tip of the glans penis is part of the time on the vulvar side of the cervix, part of the time on the sacral side (Fig. 145). Again the test tube shows that, because the meatus usually opens on the down-pointing aspect of the glans furthest from the cervix (Fig. 109), no spurt of semen can make a direct hit on the center of the target except with rear entry or forward pointing os (Figs. 146:E, F, G; 155).

What does happen during the encounter is a process probably much more effective (Fig. 145). As the blunt nozzle delivers jets while passing and repassing the protruding cone, semen is well rubbed against the slit of the external os by the cushion of the glans, and is thus incorporated in any outhanging mucous plug, or into any cervical droplets produced by sexual excitement; such droplets of normal mucus being made up of a variety of secretion especially hospitable to spermatozoa, as Kristeller and Kurzrock state. The procedure is a kind of vaccination or inunction.

Just as this text goes to press, I find the masterly articles of Kristeller describing 100 tests made with the tubular speculum, by placing a dot of iodine opposite the inner end of the cylinder. With undamaged pelvic floors the "priapus" hit the anterior fornix: pushed further it displaced the cervix, going beyond it, and tipping the uterus into anteflexion. Often it passed to one side, particularly with parous women or relaxed outlet. The more common side was the right, but whether he means the patient's or observer's right is not specified. Displacements or vaginal pockets determine the direction sometimes.

When he introduced the "spoon" speculum, used in the dorsal posture in Germany, and its inner tip was swung right or left, the cervix followed suit. Backward pull opened the os and mucus made exit, often to retreat when the tug was lessened. (Kristeller.)

A meeting head-on between glans and cervix can and does occur in retroversion (Fig. 146:F); and in that form of anteflexion where a short anterior vaginal wall drags the cervix forward (Fig. 146:E). In each of these conditions the whole vagina is short and the cervix points down the vaginal axis toward the outlet. Even then apposition can only happen when the penis is half way into the passage. If the cervix does not move out of the way to let the tip of the penis stretch the rear wall, then the glans goes by on one side, and our vaginal measurements show that the penis can and does stretch out a lateral pocket (Figs. 62; 149). This is the pocket in which the pessary for retroversion twists crossways of the vagina.

Interlocking is necessary in the dog because he does not ejaculate but dribbles, while he produces a fluid that does not "jell." Whitney describes that great swelling arising for twenty minutes at the hilt of the dog's penis to hold the organ inside the vagina until the sac around the ovary swarms with sperms, as he showed by opening the abdomen. As described by Marshall (1922, p. 258 ff.) some ruminants, including the ram, have the urethra extended in a long slender process from the base of the glans. If this is cut off, as is deliberately done before driving a flock to market, no conception occurs.

"PENIS ENTERS CERVIX"

As to the last marvel in lay literature, the glans going directly into the uterus, one notes that the diameter of the penis is four centimeters, and that of the uterine canal, four millimeters (Fig. 140), or ten to one. As if two fingers held together could enter a nail hole! Only with cervices bilaterally torn, or gaping and swollen (Fig. 29) can *one* fingertip engage in the opening, and the glans penis is at least two fingertips in diameter.

POSTURES IN COITUS

Since the beginnings of the crudest art, genitals and coital acts have been carved and pictured and constantly used as symbols or charms. These clumsy primitives are historically illuminating but not of value for our practical study. The Egyptians show us some genital anatomy and dimensions (Fig. 114). A multitude of Greek paintings of sex behavior are of exquisite grace and poise and decorative quality, with playfulness and variety and frankness, and they are shown on that unequaled source of knowledge of everyday life, the red and black household utensils or vases. Many are grotesque but the finest of them should yield our best inspiration for illustrating posture, calling only for the addition of facial animation in case we were to include features in our outlines, and omitting the genitals as unnecessary for instruction in mutual adaption and variety.

We can avoid the usual coarseness of much of the Roman and much of the cheap Pompeian art as well as the universal genital grossness of the numerous decorative woodcuts of coitus of Japanese masters of popular art, while borrowing their enthusiasm and variety of action. We might draw on the vigor of Giulio Romano's illustrations of Aretino's sonnets, softening his callous faces. We can dispense with the voluptuousness of a Rubens or the vulgarity of the early Dutch and German painter of peasants.

One looks at such material both as art and as reflecting action. Tracings or photostats have been made of all the best of it and the rest has been indexed because chronologically important. Toward such a search and index valuable contributions have been made by Feuchtwanger and Reichold, by Hans Licht, by Anton Vorberg, by Ernst Fuchs and Magnus Hirschfeld, and museums and many private owners have permitted access to this historical evidence on sex behavior.

DIAGRAMS OF POSTURES IN COITUS

If we needed to give reasons for analysing the anatomy of postures in coitus, other than normal interest in the subject, the need of knowledge on the following matters would suffice:

(1) Relation between different postures and success and failure in conception.
(2) Bearing of posture on degrees of mutual gratification and successful orgasm.
(3) Varying relation during ejaculation between male meatus and external os.
(4) Adjustments of effective pressures between the vulva and clitoris, and the male parts.
(5) Adaptations of penetration according to the dimensions of vagina and penis.
(6) Adaptations to special conditions, such as pelvic inclination and lower spinal curvature, or varying location of female urinary meatus, or height of clitoris on symphysis, or pressure on uterus during pregnancy.
(7) Comparative anatomy and physiology bearing on such matters as retention of semen, interlocking of penis and cervix, and rear entry.
(8) Search for physical or physiological reasons for the specific theological teaching that all postures save one are both unnatural and sinful.
(9) Variety of posture and behavior as a means of forestalling a monotony that may breed indifference, distaste and divorce.

DISPLACEMENT OF PELVIC ORGANS

It may be well to begin picturing coitus with a simple outline (Fig. 143) showing a guess at what happens in average penetration in the way of displacement of the pelvic organs of the woman. The word "guess" is used deliberately because there have not been published any roentgenograms of side views of coitus at a moment when the vagina was rendered visible by a coat of iodine oil or other opaque lubricant, or with a flexible stem in the uterus, nor do we know of such records made while the vagina held a substitute for the penis. As to the erect penis, it has already been stated that no statistics on its size and curvature and axis have been found, and that I have only a few reports in hand. Revision of my coital diagrams will be needed when facts are forthcoming. A glass test tube of the size of the penis has been my guide in constructing this pictorial supposition (Fig. 56).

The drawing in Figure 143 shows about the same displacement as that produced by the two fingers in the usual vaginal examination by the physician as he seeks to determine whether the cervix is in normal position (Fig. 56).

It is evident that the erect penis, acting as a piston when driving quickly and vigorously back and forth in the cylinder, the vagina, must, in expanding the passage, suddenly push ahead of it or shove aside bladder and womb and bowel, and that with each withdrawing motion these as suddenly drop back into place. A striking degree of elasticity is evidently normally present to account for this swift yielding and rebound, together with no inconsiderable arc of freest mobility for the organs in question.

The diagram called the "Route of the Sperms from Testis to Tube" (Fig. 144) gives an idea of the roundabout course of the journey. Manufactured at A, finished off and stored in the epididymis, close by, ejaculated up the vas and into the urethra and out through the penis, the hundreds of millions of sperms are diluted and stimulated to activity on the way by the secretions of seminal vesicle and prostate, and are deposited in the vagina at B. A few seconds are needed for this transit, but hours may be needed for ascent through uterus and tube to meet the ovum at the outer end of the tube at C. The ovum averages seven days in its passage through the tube. The sperms move under the microscope 3.6 mm., or ⅐ of one inch, a minute. From external os to outer end of tube is about 200 mm. so that, if they accomplish the same rate of travel as on the glass slide, they would reach the supposed place of fertilization inside of an hour. What action the uterus has on the ascent, or what help or hindrance the tube may exert belongs to physiology rather than to anatomy.

In the outlines in Figures 140 and 142 an attempt is made—apparently the first careful study since the sketch by Leonardo da Vinci—to find what major anatomical factors are involved in coitus, but this diagram considers, besides depth of penetration, deposit of semen and transport of sperms and ovum from place of manufacture to place of fusion with the ovum. This outline is useful in demonstrating the location of the common obstructions to the rendezvous (See Figures 172 and 173). It is, as far as known, a pioneer attempt to record observations by one person who is both pelvic anatomist and medical draughtsman. It must be understood to be entirely tentative, since we lack many of the statements by critical and qualified observers which are essential for correctness and completeness. However, the only way to further new studies is by textual and graphic presentation of available information, with statement of full detail, coupled with a plea for sharp scrutiny and forthright criticism on the part of those qualified to give such aid.

The posture shown is the one usual during coitus in Europe and America, the dorsal recumbent, with knees moderately flexed and abducted and feet on the couch. A dozen clinometer studies of the antero-posterior diameter of the outlet in this posture showed a rather consistent relation of lower end of symphysis to tip of coccyx, one above the other (Fig. 9). With legs straight, the lower end of the line is about 10 degrees inward (cephalad) to the perpendicular; and with thighs bent up against the sides of the abdomen, the lower end of the diameter swings outward (pedad) about 10 degrees from the perpendicular (Fig. 9). This determination of the plane of the outlet is important because pelvic inclination always affects the axis of the vagina, and not a few coital maladjustments can be corrected by changes in the posture of the couple.

The question of clitoris pressure in coitus in various postures and penetrations, the variant locations and capacity for excursion of the clitoris and the like, are shown later (Figs. 147; 153; 154) but the average shown here (Fig. 142) gives the usual seizure of, or pressure on, the clitoris between male and female symphysis.

If the diagram (Fig. 141) is approximately correct, the direction in which the semen will spurt from the meatus with full penetration, will be past the cervix, rather than against it or into it. But the ejaculate should effectively smear over and be repeatedly applied to and rubbed against the anterior lip and the external os during the average ten to fifteen seconds of orgasm and ten to thirty strokes, in which the meatus may be first on the vulvar and then on the sacral side of the vaginal portion of the cervix (Fig. 145). (This estimate of duration is based upon 124 reports from 30 persons, the extremes being eight and ninety seconds.)

Semen can apparently only make a direct hit on the target in its center, and from a right angle to that center, the external os, that is, it can only spurt directly at the narrow opening in cases of nearly complete retroversion and complete forward flexion of the cervix, and even then only with half the penis within the vagina (Fig. 146). With further entry in the presence of these displacements the glans is found to pocket even further beyond the external os, posteriorly or laterally, than with the uterus in its average location. In knee chest positions the direct hit, meatus to external os, is possible (Figs. 146; 155).

As to "descent of the uterus" during female orgasm, discussed before, what is meant by descent? With the woman on her back, motion downward toward the couch could not extend more than a fingerbreadth toward sacrum and coccyx from the accepted average location of the cervix (Fig. 15). If by "descent" it is meant that with the woman on the back, the uterus ascends along the vaginal slope toward the vulva, any shoving of the organ in this direction by straining with the abdominal muscles would seem to have little import, in view of the actions of the phallic piston (Fig. 157).

POSTURE AND STERILITY

The location and retention of the pool of semen may constitute an important factor in conception and sterility. The diagrams (Figs. 9; 152) show the declivity which will tend to hold the deposit when the penis withdraws, and the posterior wall closes up against the anterior wall under the bladder. The deep location of the vaginal fornices and retention of fluid is maximal when a pillow lies beneath the buttocks during coitus with the thighs flexed against the abdomen (Fig. 152); also when the "vaginal type" of orgasm occurs in its completest form. The latter is accompanied by rhythmic throb of the levator group about once a second during orgasm, together with some contractions after the pinnacle of sensation has passed. It is often stated that immediate postcoital outpour of semen from the vagina is a cause of sterility, but this is not yet proven. The most effective "vaginal" orgasm ends in persisting contraction of the levator group, a contraction that holds the lower vagina and introitus closed, not unlike the situation shown in Figure 135 at the left.

Even without this closure, the elevated hips will tend to keep the cervix dipped into the pool and furnish the best conditions for sperms to penetrate any cervical plug and enter the canal, while a maximal quantity of retained semen will tend to counteract vaginal acidity.

RETENTION OF SEMEN IN VAGINA

After coitus, even without rising, almost all the teaspoonful of semen runs out of the vagina, in four women out of five.

Among gynecological dispensary patients of the usual type Huhner (1913) secured reports from 107 women concerning retention. The semen ran out after coitus in 81 per cent and was retained in 19 per cent. Runge (1909) in 53 sterile women found 79 per cent reporting "It runs away at once."

Kristeller's study of vaginal retentive capacity for fluid is abstracted on page 37.

Runge in examining 83 women for the presence of sperms in the vagina, irrespective of motility, found them after twelve hours in 35 per cent, absence being three times as frequent in the sterile as in the fertile. It was in the woman with shallow vaginal vault, poor pelvic floor, and cervix low in the vagina that spill and absence chiefly occurred. However in the sterility studies of those days knowledge of the closed tube was lacking, so that to evaluate the significance of retention of a bulk of semen will require new study and taking into account present day data on both tubal patency and sperm morphology.

Spermatozoa live in the vagina less than an hour, as a rule, unless a pool is retained. Dead spermatozoa may be detected for a day or more.

Considering only husbands with live sperms, Huhner declares that the large majority of spermatozoa deposited in the vagina lost their vitality in 15 minutes, and almost all were dead in an hour. After three hours, in one series of twelve cases, he found live sperm only once. In his examinations of 279 women made from one hour to seven days after coitus —most of them after a three or four hour interval— he found dead sperms in 21 cases up to but not beyond twenty hours. In 36 cases he reports absence of sperm in the vagina where search was made from one hour up to four days after intercourse.

Runge (1909), however, in cases where the husband's sperms were numerous and active, found them in the vagina after 36 hours in three-quarters of 17 fertile cases, but in only 4.5 per cent of the 66 sterile cases. Six hours after coitus, sperm were detected in over half of the sterile; and after an interval of twelve hours, in three-fourths of the fertile, but in only one-fifth of the sterile.

Both Huhner and Runge give details of all of their cases.

Cary tells me (1933) that in 200 women examined at his office, for the most part one hour after coitus and with care not to have urinated, he finds an average of more than one cc. of semen present in the vaginal vault, the largest amount having been 6 cc., two patients asserting that none had escaped. Among dispensary patients, on the other hand, who have travelled farther and waited longer and emptied the bladder, few or no sperms are recoverable from the vagina.

In summarizing 100 office records of examination after an hour interval, Cary reports ample vaginal pool in 42; small vaginal pool in 33; and absent pool in 25 instances. The last group present reason for non-retention in retroversion and prolapse, in shallow or defectively developed vagina, or in urination since coitus.

Living sperm were present in the vagina in 58 per cent.

I draw attention to the fact that the larger the amount retained, other things being equal, the longer is the motility of the sperms.

The study of the spermatozoa within the cervical canal one to four hours after coitus is a very important procedure in the study of a sterile couple; the revival and wide spread of this method is due to Max Huhner of New York. Active sperm are commonly found for several hours, and Huhner reports them once even after five days.

I have not been able to get data on any series of very early or immediate tests to find the time, in minutes or seconds, after the beginning of ejaculation, that live sperm have been detected well within the external os. Yet it is important that these instant tests be made in order that we may know how promptly after the beginning of ejaculation any measures for removing semen from the vagina and external os should be started, such as douching or lathering.

RELATIVE PROPORTIONS

The depth of the coital canal is figured by means of the following calculation. This canal is made up of the funnel of entry (the vulva) and the vaginal tube. The thickness of tissue over the symphysis averages 2 cm., to judge from 25 published sections (Fig. 1). Compression is able to thin this pubic cushion about one-half. The female symphysis averages 1.5 cm. in thickness. We can disregard this, however, and start from the subpubic ligament to measure across to the sacral hollow. Using measurements from fresh pelves and the living woman, the average "coital pelvic diameter" (Fig. 8) is 13.5 cm. (5½ inches) but Williams and DeLee call the distance 14 cm. or 5½ inches.

Between the sacrum and the posterior fornix of the vagina the tissues are so compressible that the examining finger can feel details of the bone through the collapsed walls of an empty rectum, so that for practical purposes the front face of the sacrum can be considered the far limit. Thus a full reach from outer vulva to sacrum averages 13.5 cm. plus a compressed 2 cm., or 15 cm. (6 inches). On this basis the average erect penis of 15 cm. reaches across the pelvis, with male suprapubic region bearing full weight on female suprapubic area and with the woman's legs moderately flexed and abducted (Fig. 142).

Pelvic inclinations yielding the deepest penetration are those with the woman's thighs flexed and abducted (Fig. 152) with knees toward her shoulders or legs locked about his waist, or when she is either seated above his thighs or suspended between them (Figs. 154; 158).

In a recent instance of a seven and one-half inch phallus the absence of discomfort for either vigorous partner was a puzzle until the maximum antero-posterior diameter of her pelvis was found to be seven inches or a full inch beyond the average (17.5 cm.).

With small pelvis, short vagina or long male organ, the penetration can be lessened by the husband's thighs being kept outside of the woman's (page 108). This is particularly to be recommended during pregnancy, as our nineteen sections in Figure 52 show short or very short vaginas, save one, whatever the state of gestation. Owing to increased thickness and elasticity of the vaginal walls in pregnancy and to the thickening of the pelvic floor which develops in later pregnancy and holds back the male so that his reach is handicapped, there may be adequate protection (Fig. 64). Even so, obstetricians may have to learn from such anatomical studies as these to direct that coitus in pregnancy occur with the husband's thighs outside those of the wife, or when kneeling upright (page 108). The doctor is aware that most statistical reports show intercourse generally practiced throughout pregnancy, save among primitive peoples. During pregnancy strong abdominal pressure is to be avoided, and also vigor in action.

Dr. James Ricci draws my attention to a case of "dolorific coitus from longitudinous penis" reported by Fabricius in 1646 in which he had the man strap crosswise in front a cork buffer with an opening for the penis, whereby "with voluptuousness she could cohabit" and the "sordid ulcer" of the cervix, previously incurable, healed under treatment with quince jelly.

In the scheme of things labelled "Map of the Route of the Sperms and Ovum" (Fig. 140) the glans penis, for the sake of diagrammatic simplicity, is shown in the stage of incomplete penetration of the vagina and also as if the meatus stood opposite the cervix, but this our previous pages have shown to be an occurrence momentary or uncommon. In this diagram the testicle and epididymis are sectioned and drawn aside, the vas is shown in perspective; the seminal vesicle is cut lengthwise and rotated to demonstrate what is seldom appreciated, that this organ is nearly as bulky as the testicle, and with a large cavity. The prostate, on the other hand, is compact and would seem capable of less amount of secretion, certainly of storage of a relatively small quantity of fluid (Fig. 107).

The space available for deposit of semen is best shown in the antero-posterior section (Fig. 141), but the width of the lateral fornices of the upper vagina, even when empty, is noteworthy (Figs. 62; 63). Indeed in a small proportion of passages the deep reach of the glans strikes into a lateral fornix (Fig. 149). Women may carry the fundus on either side of the median line during the monthly cycle. Therefore, first one lateral fornix and then the other might be stretched by the glans. The bi-valve speculum, as its front and rear blade are opened (Fig. 41) to search for the external os, displays very generally a part of the vaginal wall to the (patient's) right of the cervix or in front of it. One reason for a vaginal examination with the left hand is because its finger tips face the external os.

Among structures around the vulva and vagina which have a part to play in coitus, the lubricator, the vulvo-vaginal gland, is shown on one side only (in Fig. 140, but see 138); the lower erectile structure, the bulb of the vestibule, is shown on the side on which it is most developed, but the muscles that may grasp the penis intermittently, particularly the levators and transverse perineal muscles are drawn on both sides (Figs. 133 to 139). These veins along the vagina become engorged during excitement (Figs. 66; 102). The clitoris is shown astride the dorsum of the penis, its crura merely indicated, but fading on one side and cut across on the other; the outer end being again sectioned with its compressor muscle near the bone.

INJURIES DURING COITUS

The hymen was fully discussed in the chapter on the vulva.

In India and Persia the marriage of a little girl to a full grown man, if consummated at nine or eleven, has resulted, as reported by medical missionaries, in some severe hemorrhages and an occasional perforation into the rectum. Such a perforation is pictured by Hirst (1, p. 132). The false passage from the fossa through the perineum into the rectum is shown in Figure 149:C. If persistently used it has been known to be held closed against escape of feces by the action of the levator muscles.

Rahm's review of the literature of injury may be summarized as follows. Damage occurs in two places, at the outlet of the vagina and at its upper end. Three ages are involved: (1) in young children, rape, with tears of vulva, hymen and lower vagina;

(2) in young women, nicks of the hymen with first coitus, and the moderate forms of damage to vaginal outlet seen in cases of spasm or resistance; (3) in older women fully habituated to intercourse, lacerations of the upper passage.

Attacks on children and rape of young women result in vulvar or lower vaginal injuries, whereas tears high in the passage are usually in women who have long cohabited, and sometimes a long time with the particular man. Rahm collected 127 vulvar and vaginal injuries, including 10 among his own patients, and gave a very full bibliography and abstracts, showing that 25 per cent of the tears of the vagina were in the outer section, 75 per cent in the deeper parts. The average age of the later cases was thirty-one and one-half years, the range being from eleven to seventy-two, few having disease or deformity as an explanation, and only three presenting a double vagina. Rahm credits the injury to excessively vigorous actions, particularly on the part of the woman. Disproportion in size of genitals has had its place, as with the man whose three wives all were injured on the wedding night; while five deaths are charged to this cause, including two children of eleven and one-half and twelve, one a Hindu. Altogether 12 fatal cases were gathered by Rahm. He shows the location of the injuries deep in the vagina to be chiefly on the rear wall and right side, the figures being rear, 66; right, 21; left or left rear, 15; front, 5. Nürnberger among his abstracts of records of 160 injuries found only 38 in the upper part of the passage.

I have discussed the pocketing of the glans in the right fornix which is said to be normally the larger of the two, and the usual stretching of the posterior fornix as well as the support to the vaginal vault by the backing furnished by the curve of the sacrum.

Rahm believes the damage is due to spasm of muscles high in the vagina, shortening and narrowing it. I submit that any muscle layer high up is thin (Figs. 15; 53), and that the upper vagina is unsupported except for the connective tissue masses anterolaterally in the base of the broad ligaments (Fig. 19). The weak spot is the thin partition between vagina and peritoneum, a pouch that is at times unduly deep, extending not merely one inch but at times two inches downward between vagina and rectum (Fig. 14). It is relatively deep in the fetus and the child.

Van de Velde (*1*, p. 205) makes much of "the serious danger of rupture of the vagina, with combined disproportion, vehemence, roughness and vulnerability," and wants the possibility with any violent thrust kept constantly in mind. The tone of the page is alarmist, in view of the rarity of injury.

Weakness and shrinkage of the passages in the old is seldom given as a cause in Rahm's series. He has a few injuries credited to posture, such as rear entry or a standing or sitting position. Our diagrams show that the posture in which deepest thrusting occurs is in the dorsal posture, when the woman's knees are near her shoulders (Fig. 152) or when she sits across his thighs, or pivots between his knees, impaled as it were on the penis (Figs. 154; 158). I have not met such an injury in fifty years of practice, and active service in five large, and consulting service in three small hospitals.

MUSCULAR ANATOMY OF DYSPAREUNIA

The muscles of the woman's pelvic floor, together with their fascia, have an extraordinary task. They must hold the wide lower end of the great abdominal cavity with its three openings snugly closed, yet they must allow free passage through these openings which must swiftly return to complete closure and efficient support (Figs. 134; 133; 64; 65).

The conditions of the action of these muscles make their task seemingly impossible. They hold in place an elastic cover to a bony ring wide enough for the closed fist to pass, and hold it against severe strains such as lifting and sneezing, with all the abdominal contents above pressing down. Neither fluid nor air must get by. Yet these structures must not only arrange to relax each of these openings for passage of urine, fecal column or penis, but their whole mass must completely clear out of the way for the baby's head, and then shut fully and functionally again.

The matter is relatively simple with the body horizontal, as in animals. But in the upright posture, called on as it is all day to resist downward pressure, it is no wonder that the supporting muscle structure is sometimes powerful or quick acting in closure, taking on the spasm called vaginismus when distress is expected.

The levator ani muscles and their fascia are the chief supporters of this pelvic diaphragm and the chief obstruction in resisting entry into the vagina when this is painful (Figs. 134 to 137). The total muscle weave of the pelvic floor is complex but the principle is rather simple. If one lays a fountain pen across the half-bent fingers, four of them can close up on it. Figure 137 shows the slings that surround the penis and can seize it, or which close the opening of the vagina to block entrance to it. Seen from in front the sling is readily understood and the bow shaped sweep of the total group (Fig. 138 above). As seen from below, in Figures 134 and 135, the deep layer is shown on one side, the superficial on the other (R. L. D. '89).

The sphincter vaginae or bulbocavernosus is negligible. As far as I can recall, I have found it in spasm and in active contraction only once (Fig. 85 : S689). It may, however, be of some import in its action on the bulbs. The levator and particularly its lower section that runs from pubes to coccyx, the pubo-coccygeus, is readily defined by the finger (Fig. 135 at bottom) and contracts to a thick edged ribbon to order in most women (Fig. 135 center). It is readily identified in repair operations. The "fascial" portion, the ischio-coccygeus, is often palpable, but is of much less resistance or activity. Beyond it, deeper in the vagina, active muscular fibres are not easily or often identifiable. The total mass of the sling of the pelvic floor with these muscles as an integrated part of the mass (which is like the outer edge of the hand for thickness) is striking in cases with the most developed resistance or spasm. In such cases not only the blunt pubic band but the knife edge of the levator fascia can be easily felt.

TREATMENT OF DYSPAREUNIA

The surgeon thinks of difficult coitus in terms of a knife passed through muscles in spasm; the psychiatrist thinks of dyspareunia as a mental knot to be disentangled by analysis; the gynecologist who is weary of patching—poor and late patching—begins to think in terms of prevention through routine premarital examination and instruction. For this, I have presented a program (R. L. D. 1928).

Among 4,100 married patients, I found 161 cases of painful intercourse or an incidence of one in twenty-five. Of these, 118 had disabilities that were physical rather than psychic, or at least primarily physical. As described in "A Thousand Marriages," the patient with dyspareunia comes to examination when she is about thirty; her family history and personal tendency are neurotic; she has been strictly brought up and has suffered from inhibitions and shocks; she is apt to be temperamental and inclined toward depression; there is a history of painful menstruation and some autoerotism; married four or five years, she has had only one child; in coital experience once or twice weekly the husband has quick emission, the wife little or no response, while sensation is chiefly vulvar and a climax is rarely or never achieved. With dyspareunia and the frigidity that often goes with it, the following anatomical considerations may develop:

(1) Prepuce adherent, with or without imprisoned smegma (Figs. 77a; 86).
(2) Meatus inflammation, including urethral gland infection (Fig. 90:E).
(3) Meatus dislocation near to or on anterior vaginal wall (Fig. 91).
(4) Hymen narrow, inelastic, thick, inflamed (Figs. 89; 94).
(5) Pelvic floor muscle spasm (Fig. 135).
(6) Vagina short, narrow, inflamed, double, absent (Fig. 53).
(7) Uterus displaced, tender, cervicitis, posterior parametritis (Figs. 29 and 53).
(8) Ovary or tube displaced, tender, enlarged, adherent, infected (Fig. 149:B).
(9) Disproportion in size between penis and female passage (Fig. 113).

Half the physical disabilities are classed as of anatomical origin and half as inflammatory. Retroversion is listed in about a quarter; infantilism, 10, and anteflexion, 2, in 10 per cent. The tenth with short vaginas is noteworthy. The extreme examples of obstruction are the nineteen married virgins with hymens never penetrated. These formed 13 per cent of the dyspareunics, 16 per cent of all with physical conditions, and occurred as frequently as one in two hundred of all the married women examined.

Among the inflammations, the tubes and their environs, 16, and the uterus, 13, are the seat of nearly one-half, and the vulva of one-half, with the meatus as the largest single location of distress in the whole 118, while the vagina is at fault only once in six times.

In the 62 patients with anatomical disabilities, surgery comes into play in the 4 per cent with imperforate hymen, in an equal proportion with painful postoperative perineal scars, in the inflamed fossa cases (Fig. 95) in inflammation of long meatus glands (Figs. 88; 90) in growths, and wherever operative reposition of retroversion is required for conditions not otherwise remediable.

From the notes on details about coitus made in 96 per cent of these dyspareunias, it appears certain that neither rough behavior nor frequency is significant as a factor. In the Dickinson-Beam series 16 per cent had coitus daily or oftener (Fig. 127). Of these only 5 per cent had painful intercourse. In the series of 1,000 marriages reported on by K. B. Davis and 500 by Raymond Pearl a habit of coitus one or more times daily was reported in about 10 per cent; the Kopp study of the Sanger 10,000 cases gives a considerably lower figure.

Meatus Inflammation. Infection of the urethral glands is determined by pushing them forward with the finger tip inside the vagina, which outrolls them, exposes swollen or red openings (Fig. 90 right side) and squeezes out any pus from the deeper pocketings.

Vaginal Meatus. In a patient who had been studied by other observers, failure to find a cause for pain in coitus led me to make diagrams of her vulvar anatomy, which showed that the meatus was so situated that it might well be subjected to dragging open by the phallus or to catching between it and the sharp lower edge of the subpubic ligament (Fig. 91). When the red and swollen opening had been rendered normal and insensitive by rest from coitus and by treatment, relapses on resuming intercourse occurred until she was directed to avoid harmful pressure by a different angle of entry, as secured by a pillow under the buttocks, or a posture with her knees carried toward her shoulders (Fig. 152). Four other patients in my series were likewise relieved completely by posture in coitus; and as all five instances were encountered within a short period this anatomical peculiarity is worth looking for in any dyspareunia.

Hymen in Dyspareunia. Our illustrations, particularly the sections, throw light on the question of stretching the hymen, cutting it, or "leaving everything to Nature." Figures 92:A and B show structures so thin that, in the absence of fear or spasm, gentle, well lubricated passage should be feasible for the glans penis without distress or damage within a few days of marriage. The series of drawings made during decades of gynecological examinations show that openings less than finger tip diameter are very rare. Figures 93:A and B; 94:A and B show, on the other hand, relatively frequent excessive thickness or else a formation sidetracking the glans into the fossa, both calling for section.

In hymens with openings so small or so sensitive as to prevent easy entry of the penis, it has been standard surgical practice to incise in two or more places (Fig. 95) or even to remove the structure completely (Fig. 99:S90). At premarital examination, where small size or rigidity led one to expect obstruction or undue distress, I formerly used these measures. I have found, however, when consulted before marriage or by the newly wed, that *self-stretching of the hymen* for a few days is a satisfactory substitute for cutting. The exceptions are very thick hymens, tiny openings, inflammation, and vaginal meatus.

The patient is directed to begin with the lubricated finger tip; next to gently use two fingers; and finally three, passed in as far as she can reach. Stretching daily (or twice daily) for ten to fourteen days before the wedding suffices. Self-treatment has the advantage that it can be stopped short at the point of discomfort, thus disarming reflex contraction of the muscles. It avoids raw surfaces left by incision—surfaces that sometimes remain very sensitive (Fig. 99:S90). They are easily bared of their newly healed covering. Preliminary stretching avoids fear-fixation on this area on the part of the bride.

The usual belief is that on the wedding night something must be torn open or broken and that bleeding and pain are inevitable and natural. Indeed the books for laymen (save those of Exner, Wright and Everett) are full of such expressions as "rupture," "tear," "demolish." The suggestions implicit in such gross exaggerations are thoroughly harmful, when the worst that happens anatomically is one or two nicks or notches not a quarter of an inch deep (Figs. 89; 99). Moreover, bleeding is insignificant except in very rare cases, and will never be more than a few drops in anyone who has had proper premarital attention.

Incision of the Hymen. Anatomically we find a few conditions under which it is better to cut the hymen, like a minute opening, which is rare; or thickness and rigidity. Furthermore, a deep and roomy fossa navicularis (Fig. 94:A, B) and an inclination of the pelvic outlet that makes the vulva look as if it were set far backward (Fig. 98) and shunts the glans penis towards the fossa, call for cutting, if digital stretching is unpromising.

Novocain and adrenalin numb and bleach the outer and inner surfaces. In cutting, one should cut far enough. The first clip should go deeper than would appear necessary, or sufficient space will not be gained (Fig. 95). Blunt-tipped scissors work better than the blunt pointed bistoury. Where the fossa is deep, the incision must go a quarter of an inch within the vagina, or the pocket is not eliminated. A stitch is rarely needed. If called for by oozing or to narrow the base of a long notch, it should be of fine catgut inserted with a very fine curved needle. The incision is made lengthwise of the vagina and, when sewed, lies crosswise to it at its lower end (Fig. 135, bottom left).

Section of Muscles and Fascia. Incision is called for in long-continued and extreme spasm of the muscles of the pelvic floor, if of a degree which does not yield to the removal of general neurotic or specific psychic causes, and in which failure has followed attempts at gentle stretching as described. Occasionally the band is narrow, and submucous incision with a thin-bladed bistoury will suffice, guided by a finger tip in the rectum. (Fig. 135) But one must be ready to open up such an incision in case of free oozing and therefore it is not an office procedure. The only office process of this kind may be the submucous cutting of a sharp-edged, narrow scar left after repair of perineal laceration, particularly that hard bridge sometimes produced by approximating the levators. Here again the finger in the rectum is most important. Single incision, if done, is made through the central tendon.

The band or sling, in the worst cases of vaginismus, is clearly a double lateral ridge on each side (Fig. 135:I, II and B). The band an inch within the hymen at the edge of the pubococcygeal section of the levator is the thicker, sometimes as thick as the little finger. Between it and the outer band, the relatively weak and usually negligible sphincter vaginae and superficial fascia, is a lateral pocket or gully admitting the tip of the little finger (Fig. 135:C). Both these edges may need to be cut (Fig. 135:I, B). If the incision is too far toward the pubes, opening into the mass of veins making up the bulb of the vestibule brings very annoying bleeding. One selects a spot to the rear of the opening of the Bartholin duct and hopes to avoid the gland. Perineal branches of the internal pudic artery may be cut and may call for ligature, but this is simpler than hitting the venous plexus belonging to the bulb of the vestibule, lying further forward (Fig. 138). The arterial branches are found about on a level with the lower circumference of the stretched introitus (Fig. 76).

Under ether, spasm may disappear and the bands be lost to touch. The topography must be familiar by preliminary study in the office, at least in sensitive patients endowed with strong muscles; or the patient must be allowed to come out of the anesthetic just enough to let the vaginismus grip again. This is in order to know how much to incise. After incision and arrest of bleeding, and before suturing, the anesthesia is again lightened to make sure that two fingers will pass fully with the muscles contracting, as two fingers represent an average phallic diameter. The cuts are lengthwise of the vagina. Any suturing will be partly transverse of the vaginal axis (Fig. 135:A, B).

Section of Vaginal Septa. An antero-posterior bar across the hymen does not often prevent entry, but it may be snipped under novocain if it obstructs, or when found before marriage. A longitudinal partition, making two entire or two partial vaginas may cause little bother. If there is not promise of ample space in one passage the septum may be removed. Above, there may be two cervix openings, or a double uterus. As a rule, labor will be facilitated by cutting across or taking off a complete partition before pregnancy begins.

Congenital or inflammatory narrowing or stricture high in the vagina may require plastic removal, but I have seen only two examples. Vaginal deformities are well pictured in Jayle.

The disturbance of coitus produced by shortness of the vagina and by displacements of the uterus and ovary are shown in the diagram of Figures 53 and 149. The short pelvic diameter is shown in the chapter on the pelvis (Figs. 5 and 8) and the dimensions of the penis in Figure 113.

Extreme conditions, such as congenital absence of vagina, and operations for this, are considered in the author's Chapter on Dyspareunia in Nelson's Loose-Leaf Surgery.

FORESTALLING TROUBLE

Thus we see that almost all pain or discomfort in intercourse is preventable. What we need is the adoption of a practice already followed in some circles as the general custom of the community. Its items are three: First, a consultation before the engagement is announced, or the decision made, should bring to light major bodily or mental defects or serious inhibitions interfering with marriage or fertility; second, a detailed general and pelvic examination a month or so before the wedding day is to be selected discovers local disabilities, if present; and third, the gaps in essential information can be made clear in time to fill them. For such instruction excellent books are available.

All this is mere common sense in any program of a hygiene of marriage, mental and physical, intended to increase the number of successful and permanent unions.

COITAL POSTURES: INSTRUCTION

"Leaving it to nature," or experimentation without instruction, is thought not to work well in any part of training for living save, curiously enough, in that crucial part of living particularly prone to go awry: sex union. Many deplorable sequels of neglect or refusal to instruct are to be found in the medical histories analysed in "A Thousand Marriages." These were gathered during the era of deliberate mystification, and contrast strikingly with results from the period of responsible explanation. The stories of the numerous couples reputed to be educated and intelligent who exhibited serious and preventable difficulties in coital adjustment, with life long reverberations, are all the evidence needed to call for radical revision of the laissez-faire policy, and for justifying any charts that can help to forestall calamitous ignorance.

On the positive side are numbers of instances where, by suggestion of alteration or variety in posture, the pain or discomfort, the early frigidity or the waning response have been remedied, an otherwise unobtainable climax secured, premature ejaculation delayed, or special needs provided for where these arose from anatomical peculiarities. Here several of the diagnostic matters presented earlier in this volume find their practical application.

Concerning posture in coitus a very few statements suffice, but this teaching is less than clear and effective if it lacks diagrams. Accordingly I prepared sixteen quite small outlines on one page, each one of which had been selected on the basis of demonstrated need. The form of presentation was given most careful consideration, and schematic lines, curves and angles, and robot figures were experimented with, but these evasions proved to be not a little absurd. Without grace and intensity one may not delineate ecstasy, so the high art of Greece and Florence were made the exemplars, with realism subordinated to design.*

There is a rather frequent condition, especially in the early months of marriage, wherein the wife must be the one to make adjustments for depth and direction of penetration in order to avoid discomfort or pain. Or else she needs to place herself in such a way with regard to the relations of the clitoris to his symphysis and her own that she can regulate the rhythm of action and the degree of pressure and the length of the excursion of this small and important part of her anatomy (Figs. 77; 147; 153; 154). This she can usually best accomplish by lying either between his thighs or across one of them; later, perhaps, by sitting across his lap or even by poising her whole weight, impaled as it were, above the pubes (Figs. 153; 158). The additional and important advantage of several of these postures is that thus any male who is given to quick emission will usually find himself better able to defer his orgasm, for we may never forget that swift ejaculation is one of the most frequent and obstinate disparities in marriage.

A wife complains that her husband's weight spoils her feeling or her climax. It develops that he places himself in one of the positions which we have called "full weight" or "full length,"—and in no other. When direction is given that trial be made of other postures, she is relieved by his supporting himself on his hands (with arms straight) and his knees; or by his kneeling upright between her thighs as she lies across the bed with her buttocks at the edge and her feet supported; or with her body raised on pillows lengthwise of the bed; or else she assumes one of the various postures above him. By one or other of these expedients, which one would suppose any pair might have imagined for themselves, she secures a full climax. Perhaps he has a large abdomen or she is halfway through pregnancy. Her lifted hips or his kneeling position solves their difficulties. Throughout pregnancy, however, the rather consistent shortness of the vaginal passage shown in Figure 52 renders still more desirable that posture in which his thighs are outside of hers.

In delayed conception raising the hips, in one of the three positions described later, best retains the semen by rendering the vagina nearly perpendicular as shown in Figures 9 and 152. The uplifted variants also provide for heightened reciprocity and deep penetration.

For some women with stout inner thigh, successful pubic pressure or proper depth of his entry are possible only by sitting astride the husband's thighs when he is supine or seated. The side posture is adapted to prolonged embrace or varied foreplay, or for the slow subsidence emphasized by Stopes, as well as for those who need to conserve their strength. Rear entry (Fig. 155) has its own field, as in pregnancy, in women with limitation in spreading apart of the thighs (Fig. 157, inset) and for some of the relatively large number who have that exclusively vulvar location of feeling which requires digital caress to evoke orgasm. These latter may only need this rear approach (or lying above) until the habit of effective response and sure climax has been well established and full association developed between the vaginal pressure and the clitoris reaction. Then the pair can assume the usual postures like the dorsal recumbent. The usefulness is temporary but essential.

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* Our advisors deem the medical profession as yet unready for this chart. In order, therefore, that there may be no inequality between purchasers of the early and a possible later printing, a slip is enclosed for forwarding to the publishers, to be accompanied by a request from the physician on his own letter paper, for such page or pages, if and when published.

Entry guided by sight is also specified because needed at first with the shallow "funnels of entry" of Figures 94:D; 92:D; with the small vulvas of Figure 79; and with the "rearward" location of the vulva due to spinal attitudes and deflected outlet given in Figure 98.

POSTURES: VARIETY

The literature of the Orient is prone to refinements in description of attitudes in coitus, enumerating as many as forty-four or ninety-eight. While I have indexed and abstracted several of these writings in search for information of value to Marriage Counsellors, I find that a quite simple inventory can include whatever is of practical value. Medieval and later writings that describe coitus are more restricted in their lists and more specific. The recent series of lay texts on marriage and sex life go into considerable detail on coital behavior and positions and this instruction is for the most part both practical and necessary.

I have assembled in source books a collection of sketches of museum material and a very large number of tracings from illustrations germane to the subject, in order that any fully accredited student may be able to find what there is of value for anatomy, physiology or sociology without elaborate search among scattering references. Like the beginnings of this Atlas, this collection has been a private one for which the Committee need feel no responsibility. This material will eventually be left to the Academy Library, or to whatever agency takes over from our Committee.

POSTURES: MAIN GROUPS

The *recumbent* postures include, man above, woman above, side by side, and rear entry.

The *partly upright* include lying-kneeling, sitting, and knee-chest.

I. *Recumbent Postures*

A. (1) *Man above:* woman on back, feet on couch and drawn up part way, knees bent and apart; man kneels between her thighs, bends forward to adjust his entrance, then lies above her (Figs. 9; 142). His weight is supported below on his knees and thighs, and above, either on the elbows or by the hands with straight arms; or his full weight is upon her; or he may lie full length all along above her.

(2) Her legs can be lifted, with hip joints more or less flexed and knees bent and the thighs upright, or else with thighs drawn up close to abdomen with knees approaching shoulders (Fig. 152); meanwhile her legs may be locked about his waist, or supported above his shoulders. In any of these postures the buttocks rise from the bed and are held up with or without a pillow under the buttocks. In all of these attitudes the vagina becomes nearly perpendicular, and the semen is best retained (Fig. 152).

(3) He spreads his thighs across one of her thighs, then enters and lies forward somewhat diagonally, thus securing strong seizure of clitoris between symphysis and symphysis.

(4) His thighs are outside hers so that he is prevented from entering too deeply.

(5) He enters not at all, the penis lying in the groove between vulva and closed upper thighs. (Fig. 159 b.) This interfemoral method is used to spare the virgin hymen.

(6) Older men with poor erection have produced full clitoris pressure and excursion and response in wives whose orgasm is vulvar by symphysis pressure, the penis supported by one thigh pressed up between her thighs. (Fig. 159 a.)

B. (1) *Woman above:* Man on back, thighs apart; she kneels between and the entrance is effected: then she lies full length, or supported on elbows or hands (Fig. 153).

(2) He lies with thighs together, her knees outside of them; the entry is made in a sitting posture (Fig. 154) then she stretches above him.

(3) She lies with her thighs across one of his thighs, somewhat diagonally.

C. *Side by side:* She on back, he enters, then turns on his side to lie with his waist or hips across her bent-up thigh, thus permitting prolongation of intromission and play. She turns also.

D. *Rear entry:* She on side, with thighs strongly bent upward, he enters vagina from behind; he can give full effect to desired mammary caress or to any digital vulvar manoeuvres which may be necessary to secure her orgasm (Fig. 155).

II. *Partly upright:* lying-kneeling; sitting; knee-chest

A. She lies on back in such a way that he can kneel more or less upright between her thighs. This involves, if lengthwise of bed, pillows to lift her body; if crosswise, with buttocks at edge of bed, or low couch or reclining chair, and with feet supported on chair or stool; he kneeling on footstool or pillows. A large abdomen in either partner calls for such arrangement.

B. (1) He sits on armless chair and may slide somewhat forward; facing him, she sits across his knees (Fig. 154).

(2) He lies on his back with thighs together; she kneels, facing his face and spreading her knees across his thighs. (Or she may face toward his feet.)

C. She kneels and bends forward, elbows and chest on couch, he entering vagina from rear (Fig. 155). For sterility this used to be thought efficacious, but retention of semen is less than when recumbent with elevated hips.

It is somewhat general experience that fully endowed couples play with a variety of postures and then settle down to one or two favorites, the recumbent with male above being by far the most employed and the only one permitted by one church; the side posture probably coming next, then sitting, then wife above. For quick and casual use, sitting is reported the most frequent. The special indications are given earlier in this chapter.

Last, but not least, in planning response and interest in terms of a lifetime, artistry avoids monotony. This applies not alone to variety in action but to variety in atmosphere and adventure, to the notion of sea and sky as none too spacious and spring woods or moonlight none too gracious as background and as setting for rapture and splendor.

CHAPTER VIII

ANATOMY OF THE CONTROL OF CONCEPTION

LOCATION *of barrier or sentry—Chemicals—Cervical caps—Vaginal diaphragms—Intrauterine mechanisms—Salpingectomv—Male mechanics—Vasectomy—Suburethral incision—Irradiation and heat to testis—Anatomy of abortion—Anatomy of sterility—Insufflation—Denudation—Pelvic roentgenograms.*

(FIGURES 160 TO 175)

THE ANATOMICAL mechanics of prevention were pictured in "Control of Conception: An Illustrated Medical Manual," issued in 1931, and this also included a program for fewer and better abortions. The illustrations taken from this book are largely self-contained, owing to full labelling, and can readily be turned into lantern slides painted in flat color; or slides may be had from the Committee. They are of service when instructing patients, as well as students.

Certain diagrams are repeated here in order to facilitate check up of anatomy against mechanical devices, or operative procedure. A summary of the anatomical principles involved in birth control is all that the present text need cover, as details are given in the legends accompanying the figures.

Finally a brief section is added on the anatomy of sterility, to complete the outline of control of conception.

LOCATION OF BARRIER OR SENTRY

The rendezvous of sperm and ovum being the outer part of the oviduct (Figs. 45; 140) and the place of deposit of the semen being the upper part of the vagina (Fig. 141) prevention of a meeting between egg and spermatozoon will be best effected by a blockade either in vagina or uterus or tube. The most obvious spot (Fig. 160) to station a chemical sentry or locate a barrier is in front of the most accessible of the gateways, the external opening of the cervix. A paste or jelly or viscid foam to cover and to close the external os, or a swift acting sperm killer to be trusted to cling to the spot on guard, or a combination of the two, is a natural first thought. (For details on the "Chemistry and Physics of Contraceptives" see the forthcoming volume of that title, by C. I. B. Voge on his three year research on chemical spermicides and vehicles for the chemicals. Studies are still needed to make sure that no such effective agent will do hurt to vaginal linings.)

It would seem simple to cap snugly the projecting cone of the cervix, provided the woman can readily reach in to it, and provided thrusting by the penis does not push the cap aside (Fig. 160:B). If displaceable thus, it would appear that a concave shield over the opening with a stem just inside the cervical canal might steady the device (C). If this did not furnish safe closure, then a rod running up higher might, or a spring spreading in the wider upper part of the canal (D). If a metal or silkworm stem reaching from vagina to the top of the inside of the uterus were found to form a ladder for germs to climb, then a circle, a triangle or a "V" up in the cavity of the body might discourage passage of sperms or prevent nesting of the ovum, or else make it give up, if once starting to grow (E). If the tissues and organs would tolerate these intrauterine devices they might be worn all the time between periods, or, if made of actively antiseptic material like silver, for months at a time.

These are the uterine *ifs* that must be studied clinically, by the many thousands.

Now let us turn back to the vagina. Should the tight cap on the cervix itself not work well or only in certain selected instances, how about a barrier below the cervix, an elastic domed partition that would press outward against the vaginal walls so that neither phallus nor sperm could get by? (Fig. 160:F). Adapted for a region more accessible than the cervix, it would seem feasible, and also appear practicable provided one took anatomical variations fully into account.

SALPINGECTOMY (FIG. 167)

The third locality for blockade is the tube, either outside of the uterus or where it passes through the uterine wall. In the thin part of the tube a bit may be cut out between two ligatures and the ends buried (1) or a loop of tube may be crushed and tied, or a wedge is removed from the corner of the uterus where the tube enters (VI) and this gap is snugly sewed over.

In Figure 167a the arterial circulation is shown, to demonstrate that total removal of the tube may cause a menopause by cutting off the ovarian blood supply. Even puckering of the broad ligament by mass ligature may do this, or catching the uterine artery beneath the cornu with ligature or suture when ligating a tube near the cornu or when removing a wedge. Note the marked vascularity of the angle of the uterus, which explains such location of a cut off, and also accounts for some hemorrhages following the wedge operation by the vaginal route. I to V, steps in exsection and ligature. IV, diagram showing cut ends buried in the broad ligament under the peritoneum. VI, VII, the wedge operation, shown in perspective and section. The Madlener ecraseur and double ligature is the simplest and speediest of accredited methods.

Transverse Abdominal Incision. In Figure 167b, the steps are pictured of salpingectomy with a nearly invisible scar, by the gridiron incision of Pfannestiel. Room for two fingers suffices. I and II show that the transverse incision (A) through skin and anterior sheath of rectus, and the separation of the muscles (B) and the vertical incision in the peritoneum in V avoid vessels and nerves and yield the maximum guarantee against hernia. This standard incision is particularly adapted to the minimal intra-abdominal manipulation called for in this operation.

CAUTERY STRICTURE

As these procedures involve opening the abdomen, the present search is for a method under local anesthesia and without incision, by approach from below and from inside the uterus; this must shut off the bristle-sized opening at the upper angle by a stricture. Such a circular scar results from a small chemical or electrical burn which can be an office procedure (Fig. 160:J; also Fig. 166).

The infrequency with which this attempt has been made is due chiefly to delay in visualizing the area: with the new hysteroscopes, visualization can standardize the steps of the procedure. A probe tipped with the corroding chemical must remain in place long enough to produce the damage, a time not yet determined; or second, the stricture is produced by a burn done by a platinum tipped sound heated by electric current; or third, the same result is brought about by fulguration or electrocoagulation at the cornu. Local anesthesia suffices, and there is no lay off from activity. The later test of the tube by air or gas makes sure that the closure has been complete and remains effective.

Small canals lined with mucous membrane so often exhibit strictures that theoretically the bristle-sized opening of the tubes should be easily blocked, particularly as there is little of that strong driving pressure from behind which is present in the vas, ureter or the urethra. The mucous lining of the uterus at the cornu is thin. An application to make it slough in its entire circumference but in a narrow area, so that raw surfaces adhere, hurts no more than a dilation or the hot wire to the cervical canal, and less than a biopsy in the office in looking for corpus cancer.

Electric Cauterization. Before sterilizing by the cautery wire (or by electrocoagulation), the shape and size of the cavity of the uterus must be defined as discussed at length in an earlier chapter. The uterine sound gives a very fair idea of the upper corner, whether acute angled, rounded or domed (Fig. 166). In the latter cases the vestibule of the tube is difficult or impossible to find. For such conformations, visualization, as by roentgen shadow from injected iodized oils, is needed, or else the same skill with the new hysteroscopes of Rubin and Gauss and of Mikulicz-Radecki and Freund, as has been attained with their parent, the cystoscope. With the aid of the eye it may be possible, in the future, also to dilate the minute uterine funnel as accurately as the mouth of the ureter can be, should it be desired to reopen a cautery stricture later.

In my simplest method (first described in 1912), after the length of the cavity is determined, the cautery sound is slid up against the external os so as to admit only this length. The possibility of pushing in farther and perforating is prevented by the sliding shoulder fixed where needed. When the cautery tip has been nestled into one upper angle of the uterus the current is turned on for from ten to thirty seconds, according to the vascularity of the lining, a succulent uterus needing a longer application of the current. A test is made by starting to draw the sound away. It should adhere rather firmly and bring away a shriveled fragment of tissue all about it. Only in case the uterus relaxes, as it does during curetting, need one consider new sounding and renewed cauterization at this session. Pituitrin may prevent this.

The treatment is given soon after a menstrual period, or halfway between periods. The two sides may be done at one treatment, or the second a few days or a month later. A douche is ordered in case of discharge. When the burn on the cervix, A, which is used as control, has turned into a firm scar, then the tubal scar, D, should also be firm. This shows why the test of patency by insufflation should be deferred two months. The pressure need not go above 140 mm.

The cases thus treated have been too few—about sixty-five in all—to permit the drawing of conclusions. In animals the uterus is not of comparable shape, so I abandoned my experiments, but Prudnikoff in 1912 and Mikulicz-Radecki and Freund in 1927 did well with electrocoagulation in animals.

Numerous preliminary tests must be made in the following way to determine the average time and the outside limits of heating. When an abdomen is opened with the purpose of cutting out the wedge from the cornu for sterilization, after the uterus is held in the hand, the tip of a cautery sound which is within the uterus is heated and a time record taken, so that one can know the number of seconds at a given heat beyond which there is danger of perforation. The cornu is then cut out and the specimen studied. Thus, without prejudice to the patient, a series of observations will standardize the cautery procedure. I have had only four such experiences. Prudnikoff's first trials preceded hysterectomies for cancer; my first, of the same year, preceded hysterectomy for fibroid. (Kocks (1878) I found years later.)

Chemical Cautery Stricture. The suggestion was advanced by Froriep in 1849 that fused silver nitrate on the end of a sound be guided into place by a hollow conductor. The slough would be cast off in seven days. No case histories have been found. Since Froriep's time, several new developments have borne on his plan, such as the Guyon and Hagemann casts of the cavity (Fig. 28), roentgen shadows after iodized oil injection, insufflation, the study of caustics, and the hysteroscope. Siredey's 15,000 cases of cervicitis treated with quick acting potassium hydroxide and lime (Filhos' crayons) show how cervix stricture is feared, and how it occurs unless follow-up dilation is systematically carried out. This gives a clue to those who want stricture to occur, but this particular caustic may be unmanageable. Chemical stricture may be the office method of the future because it is the simplest of all, though cautery stricture is easier to accomplish. Both may be repeated, and tested without known risk, provided no testing by insufflation is done until the slough is entirely gone and the surface is healed and sterile.

The other principle of sterilization that may be invoked is physiological rather than anatomical, namely, limiting the production of ova by hormone action, or damaging the egg-producing function of the ovary by irradiation with X-ray or radium or by immunization to conception by spermatoxin. See pages 122 ff. of "Control of Conception" for discussion of these other methods of arrest of fertility, that may be either temporary or permanent.

VASECTOMY

The anatomy of the male presents fewer points of importance for fertility control. The complete cover for the erect penis, the condom, of good quality, is a simple mechanical solution.

For permanent effect the seminal duct is crushed or cut and tied under local anesthetic just above the testicle in one or two places (Fig. 166). It is clear that while the minute quantity of fluid that comes up the vas at normal ejaculation contains the hundred of millions of sperms that constitute the vital element for conception, the bulk of the teaspoonful of semen ejaculated is from the seminal vesicles and the prostate, and this bulk is not affected by vasectomy. It will be seen that the seminal vesicle in section in one aspect has an area nearly as large as the testicle (Fig. 140).

The simplicity and freedom from aftermath or handicap following section of the sperm duct, lead me to restate its steps in pictures. In Figure 166a the surgical anatomy is shown in A to G, the steps of one method are shown in numbers 1 to 13.

A, testicle and epididymis: dissection above and diagram of antero-posterior section below. R is outside the rete; ED, ED, the efferent ducts. B, left testicle and epididymis above it, seen from the left side, showing artery hugging the vas, and the anterior venous plexus through which the usual operative approach is made. Compare with cross section at E and G.

C, anterior aspect of scrotum with loop of vas drawn out of incision; the anatomy is indicated by faint lines. D, incision closed by a single stitch; faint lines show the end of the duct, a ligature on the upper end only. E, cross-section of left spermatic cord, lower third, lower surface (Pellacani); note how far to the rear the vas lies, and the nerve plexus, shown by minute dotted circles, in front and on both sides. E and G raise the question of latero-posterior incision—or the posterior attack endorsed by Edward Martin of Philadelphia.

F, diagram of forward displacement of a cut end of vas when the cremaster muscle and the tunics, cremasteric and common vaginal, are sutured across the gap between the severed ends, as in 12. G, section of left cord from above, showing scrotal skin-cover and relation to thigh. The line showing the scale applies to all drawings except E, F and G (one-half life size).

Ligation of the upper cut end of the vas only is preferred to ligation of both ends, as ache from distention of the epididymis is avoided and the pressure may open the lower end anyway. The total secretion at orgasm is a minute drop or two, readily absorbed, the bulk of ejaculate in coitus being made up of seminal and prostatic fluid. Crushing and double ligation of the seminal duct like the Madlener procedure on the oviduct would be much simpler than the dissection here pictured.

Suburethral incision with a permanent opening to side-track the semen is an Australian aboriginal practice (Fig. 117). Finally irradiation of the testis, or simple heat by half-hour immersion of the scrotum in water hot as the hand can bear, may suspend manufacture of spermatozoa for many weeks.

Sensation is not affected by these permanent or long duration procedures, except that after X-ray a lessening of response is somewhat frequent.

ANATOMY OF ABORTION

Selection of the safest time and simplest procedure for interruption of pregnancy involves study of the interior of the uterus at various early stages of gestation. (Chemical irritants and X-ray are considered in our Manual, "Control of Conception.")

When the lining is thick enough to effectively damage or scrape off easily, but not so far thickened that such curetting may bring on alarming bleeding, at such time we have the preferable period for action. This is a point somewhere between the early limit, that is when menstruation is seven to fourteen days overdue (and when the woman's urine can be used in the mouse or rabbit test to make the diagnosis of pregnancy) and the other limit, which is early in the third month. This is the best time as indicated by the specimens here exhibited of the linings of the uterus of early pregnancy (Figs. 168; 169). Even at the end of the second month more spongy structure is seen in a few examples than is desirable in order to ensure easy operation.

Implantation. The place which the curette must particularly search to find the ovum is all important. My study of fifty-six pictures in the literature found the ovum implanting itself in the middle line of the cavity (Fig. 168) nine-tenths of the time, in front as often as in the rear, and preferably high up; only three implants being fundal and two cornual. Samples of the anatomy of what the curette feels I have given in Figures 168 and 169 and the correct anatomy of the operation for the first time in Figures 170 and 171. It is evident that the later specimens in Figure 169 demonstrate an amount of spongy material which will, during removal, give rise to swift and free bleeding, and that the three from B to E furnish much more favorable conditions.

The Manual discusses these points in some detail, and they are confirmed by Holzapfel, who in a careful study of placental sites in 89 instances found three-fourths wholly on the anterior or posterior wall, almost equally distributed between the two faces and nearly central; the center of the placenta one-third of the way from the fundus to the internal os. Nine, or one in ten, lay in the cornu, with nearly equal division—three were lateral; five partly on the fundus; one over the internal os. The cavity of the uterus runs to two types, a broad squat triangle and a longer narrower triangle, with all these angles rounded.

INCIDENTAL HYSTEROTOMY

Where sterilization is required and early pregnancy exists, it is well sanctioned surgical practice to open the abdomen, close off the tube, incise the uterus, remove its contents, and close the incision. In other words, *sterilization plus incidental hysterotomy* is better than abortion by dilation and curette and subsequent abdominal operation. And a better alibi.

ANATOMY OF STERILITY

Two very simple schemes are submitted in Figures 172 and 173 which do not pretend to balance, emphasis nor completeness.

The morphology belongs in two main areas, namely defective development and pathological anatomy. The field of physiology cannot be fenced off from anatomy, wherefore the activities of the anterior pituitary dominate the first diagram. Consult also Figure 43. Attainment of full growth by the reproductive organs and regulation of the monthly cycle for production of the ovum and preparation of the uterine lining for nesting the egg are largely credited to the powers above.

Functional unbalance, infantilism of organs, the disturbances in cervicitis and the tubal blockades are thought to be the chief factors in female sterility. Complete shut-off in vagina and uterus are very rare. Partial occlusion at the internal os and in kinked tubes have some claim to attention. A microcystic ovary functions little and the persistence of the corpus luteum arrests menstruation and ovulation. Adhesions that close the tube may be due, not alone to the gonococcus or post-abortal or post-partum infections, but to peritonitis from early appendicitis or abdominal inflammation.

The gynecologist studying sterility knows little about the male, but is more familiar with defective spermatozoa than the male genito-urinary specialist or the laboratory chief. Note the varieties in the Moench table in Figure 124. Bumm, as quoted by Nürnburger, credits one-third sterility in any couple directly and one-third indirectly to the male, so that gonorrhea is given the other main heading in Figure 173. Blockades in the tail of the epididymis are due to inflammation following mumps, scarlet fever, and sepsis as well as to the gonococcus. In studies of sterility seminal vesiculitis in its chronic form is receiving increasing attention as well as prostatitis. Narrowings of channels, as of the prépuce and urethra (or prostatic enlargement) are rarely such as to prevent exit of the fluid vehicle bearing the sperms. These disorders are depicted for completeness as part of the disabilities consequent on inflammatory processes, and include also minor and infrequent factors such as balanitis, cystitis, as well as such rarities as plastic induration and hypospadias.

If the common closure low in the epididymis is to be remedied, it will be seen that the vas needs to be implanted in the head of the epididymis, but not more than a quarter of these operations, even when expertly done, have resulted in pregnancies carried to term. They are nearly as discouraging as the abdominal operation to reopen tubes, or for reimplantation of tubes into the uterus.

TESTS OF TUBE CLOSURE

Diagnosis of tubal closure, as cause of sterility or as test of success after stricture or ligation, depends upon roentgenogram or insufflation. Air or nitrous oxide is simpler than X-ray and gives all needed data. Distention with an opaque fluid, essential in the early study of closures, has little warrant now that we possess the evidence, because closure may be produced in healthy tubes, or even peritoneal reaction. For insufflation, my glass tube has the advantage over the metal cannula with its rubber shoulder cone, in making visible any coagulated blood or secretion inside the lumen, and also any air bubbling out past the shoulder, and affecting the manometer reading, as easily happens with torn cervices. (See Nelson's Looseleaf Surgery, 1929, p. 751.)

DENUDATION OF CORNUAL ANGLE

For sterilization, a mechanical method of completely removing the mucous lining of the cornu is shown in Figure 166, whereby a circular scar later constricts the tubal opening. No curette can reach into this narrow angle. The burr or reamer on a flexible shank hidden in a hollow tube, is exposed to exert its rotary action in denuding down to the muscular layer, over an area large enough to prevent regeneration of the mucosa.

STANDARDS IN PELVIC ROENTGENOGRAMS

Pelvic diagnosis by X-ray has been so fully pictured that we need not give it space. But there is need of a standard procedure and scale to make the roentgenograms comparable. It is not clear why the range should run from 21 to 30 inches, or be widely varied with a Bucky diaphragm; nor why, as shown in Figure 174, authors should disagree on the direction from which to take a front or rear view; nor why a standard reduction in reproduction should not obtain, avoiding a variety of scale in a single book or even in a series on a single page.

Certain inevitable distortions are to be taken into account when interpreting any film. Figures 174 and 175 show how strikingly distance from the film affects the breadth of sacrum and coccyx. Thoms' centimeter grid gives a handy means of estimating distortion in any plane, by a second exposure with the grid held in that plane.

CHAPTER IX

CONCLUSION AND PROGRAM

THIS VOLUME is a mere sketchbook, a beginning.

If the present tentative form of the Atlas is to be developed into a volume worthy of the subject, the next step would be placing opposite each *main* outline a finished drawing giving actual structure in detail, as shown in our median section of the organs of the female pelvis (Fig. 15), and in the median section of coitus (Fig. 142), and in addition to these there should be included whatever color is needed for clear understanding. In any future edition many diagrams of the processes whereby averages were here worked out could be omitted, having once been stated.

PROGRAM

The Encyclopedia of the Sexual Science of the future should be planned now. The volume on Human Sex Physiology is overdue.

In such a scheme this picture book takes a place as one of the processes in sex study, namely, furnishing material for texts for sex instruction. Some of its drawings have been used in our own "Control of Conception: An Illustrated Medical Manual"; and also in lay texts, as in Mary Ware Dennett's "The Sex Side of Life"—with its endorsement by the United States Circuit Court of Appeals; in one edition (1929) of Oliver M. Butterfield's "Marriage"; in Roy E. Dickerson's "So Youth May Know"; in Dr. Max J. Exner's "The Sexual Side of Marriage"; in the second American edition of Dr. Helena Wright's "The Sex Factor in Marriage" and in M. S. Everett's "Hygiene of Marriage."

After texts and drawings, the step next in order is a series of teaching models, made first for medical museums and medical colleges and at moderate prices. They should begin with the simple and normal and go on to injuries, deformities, growths and diseases. Indeed every doctor's office needs simple models for instruction of patients.

Any text book or preliminary text book should be developed with the idea of tying into a plan. Planned helps for teaching may be graded somewhat as follows:

THE ORDER

First the word, then the picture, next the model, last of all, life in action. So we begin with simple speech, duly guarded, and go on to talk straight and explicit; our diagrams turn into texture and color; our models grow into full representation, while detailed personal instruction comes last of all. In all instruction, teaching in two dimensions seems unsatisfactory, once three dimensions have been used, while actual conditions furnish the final teaching form. Here are three examples of these graded processes applied in practice, all with a bearing on human sex anatomy and instruction.

When I taught in medical school on the subject of heart and lungs, it was by outline text and then full text; with my own life size charts; with life sized models; with markings on healthy chests; by stethoscope and microscope and laboratory specimens and slides; in clinic and ward with sick people. When I taught obstetrics, again life size charts and three dimensional models and actual people came as early as possible. The student handled the bony pelvis and baby head models; I made him a cheap plaster pocket size pelvis and a head, both half life size, to follow out otherwise inconceivable flexions and rotations and planes of entrance and exit; I persistently supervised delivery of full sized dummy babies or fetuses on manikins of women made of wood and rubber (the earliest group in this country) with four manikins per eight students, a pair of men together training their touch and their technique. I took the student to deliveries in ward and tenement as early as 1886 and made him take full responsibility. The best of these examples of manual and surgical dexterity, acquired without risk to patient or nervousness in operation, were my flexible life size models of injuries to pelvic floors recently torn in labor, to be stitched, and stitched again, till apposition was exact (Fig. 97).

PREVENTIVE MEDICINE

In disorders of women, teaching by chart, model and living structures have their place, not alone in the college, hospital and clinic, but in the gynecologist's or obstetrician's daily office work. For example, I know of no measure more effective as a means of impressing women of the need of prevention of cancer of the uterus than the following, which I have tested for years. The patient whose cervix, torn in labor, is granular and eroded, is shown a picture of a healthy cervix, then one of an inflamed cervix like the erosion in Figure 29 and then her own cervix by means of the handmirror held by her in front of the speculum. This square inch of raw, red "proud-flesh," bleeding at a touch, she does not forget. Then the cautery is applied. Preceding the second application, three weeks later, her eye can appreciate the healing and shrinkage, and it recognizes in a subsequent demonstration the smooth, pink, healed surface. She thereby is convinced that routine examination is required, and that the surface must be kept sound in order that it shall not develop cancer. This is human sex anatomy taught as preventive medicine.

So in birth control. The husband is shown diagrams such as those in this Atlas and is taught to test the condom. At the premarital examination the office nurse teaches how to douche and the doctor may need to show the bride some diagrams and also how she is to stretch a narrow and tender hymen. For pessary placing, whether for retroversion or for contraception, the patient sees diagrams of her vagina and uterus (one should have models also) then is shown her cervix in the speculum to give her an idea of what she is to feel, then her fingers recognize the external os and its backward or forward direction; lastly she places her pessary, first in the wrong way, then correctly.

Perfection of technique for physical sex response is starting to become part of lay teaching on marital hygiene, even before it is taken up by medical schools and medical societies. When the time comes that diagrams and descriptions of the normal functions of these universal organs are as generally accessible and as much taken for granted as are pictures of other life processes, we shall doubtless wonder at our artificially fostered mystifications and many of our elaborately manufactured attitudes of shame, and yet not lose our feeling that privacy for intimacy is good taste as well as enhanced delight. Then after the era when nakedness becomes a matter of course again, we may look for morbid curiosity to be replaced by legitimate information, and celibate teaching of innate dishonor in sex function to die, exploitation by cabaret to starve and pornography to be disarmed.

Many of the discussions on sex education, verbal and clinical, would not need to be drawn into the text of a medical picture book if it were not that they seem essential parts of the ultimate medical and clinic curriculum, rounding out any program of instruction in the hygiene of sex life.

Wherein no inconsiderable section is visualization.

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PLATES

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VII.	The Anatomy of Coitus	125 to 159
VIII.	The Anatomy of the Control of Conception	160 to 175

ERRATA

FIGURE	
21	Eyc*l*esheimer should be Eyc*h*leshymer.
22b	Rich*t*et should be Ric*h*et.
27	Le*i*pmann should be L*i*epmann.
32	Tem*or*ary should be Tem*es*vary.
	Mauclair should be Mauclair*e*.
37	Heli*é* should be H*é*lie.
66	Spiegelb*u*rg should be Spiegelb*e*rg.
74	Femo*v*al should be Femo*r*al.
84	Prurit*i*s should be prurit*u*s.
85	Sentin*a*l should be sentin*e*l.
94	Rued*i*ger should be Ruedi*n*ger
113	Wolb*ae*rst should be Wolb*a*rst.
120	*L*ahn should be *K*ahn.
172	Diverticul*i* should be diverticul*a*.
173	Epidid*i*mitis should be epidid*y*mitis.

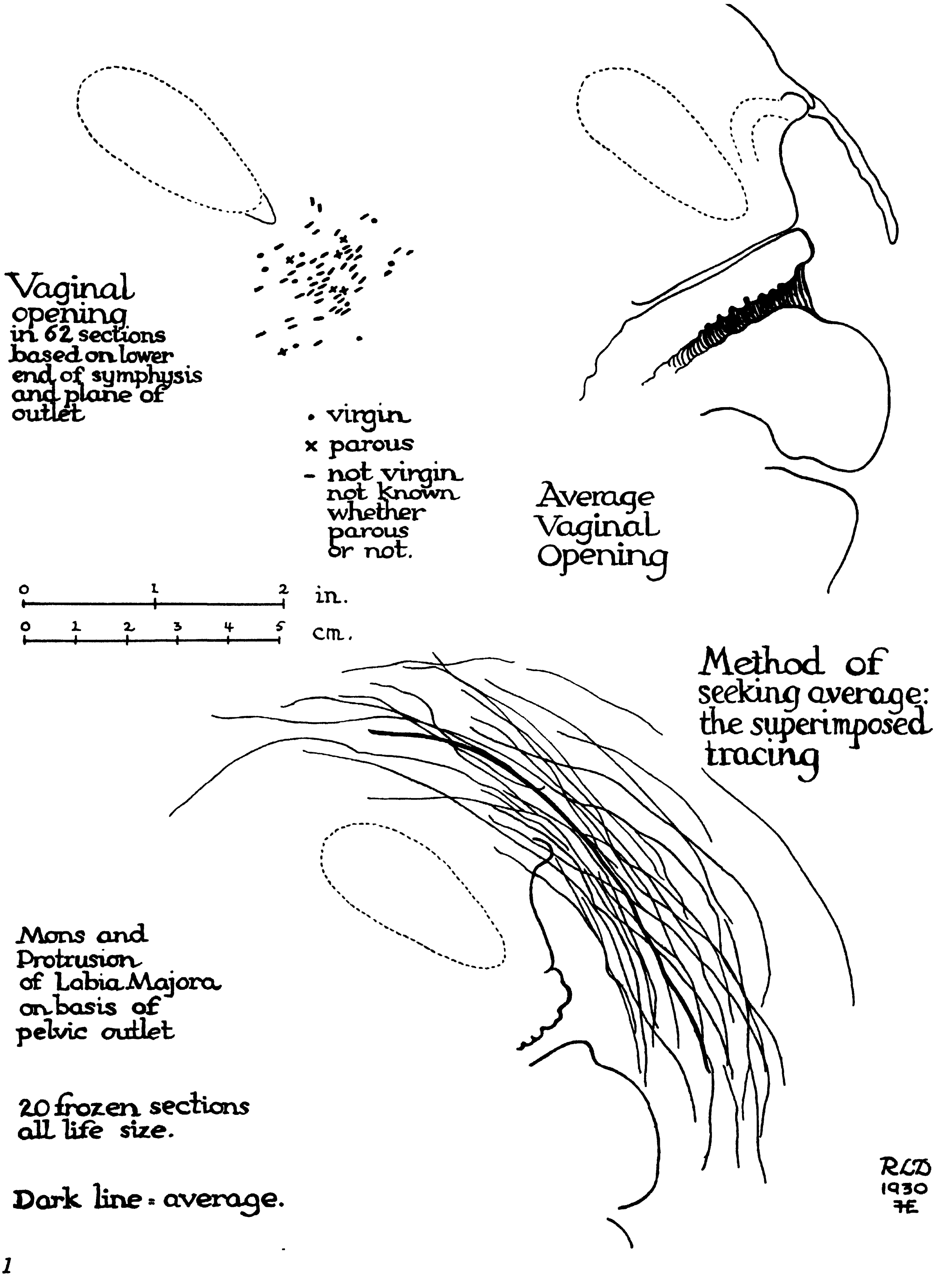
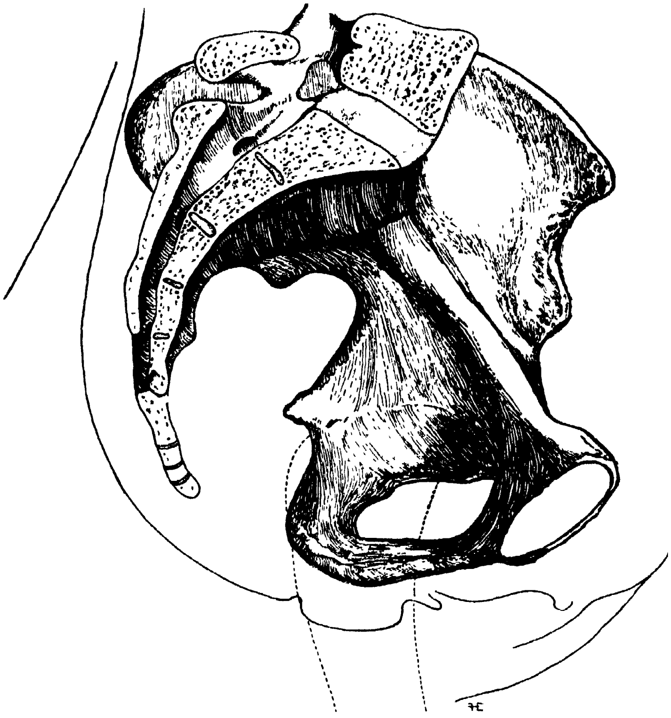

Vaginal opening in 62 sections based on lower end of symphysis and plane of outlet
• virgin
x parous
- not virgin not known whether parous or not.
0 1 2 in.
0 1 2 3 4 5 cm.
Average Vaginal Opening
Method of seeking average: the superimposed tracing
Mons and Protrusion of Labia Majora on basis of pelvic outlet
20 frozen sections all life size.
Dark line = average.
RLD 1930 TE

Fig. 1

CHAPTER II

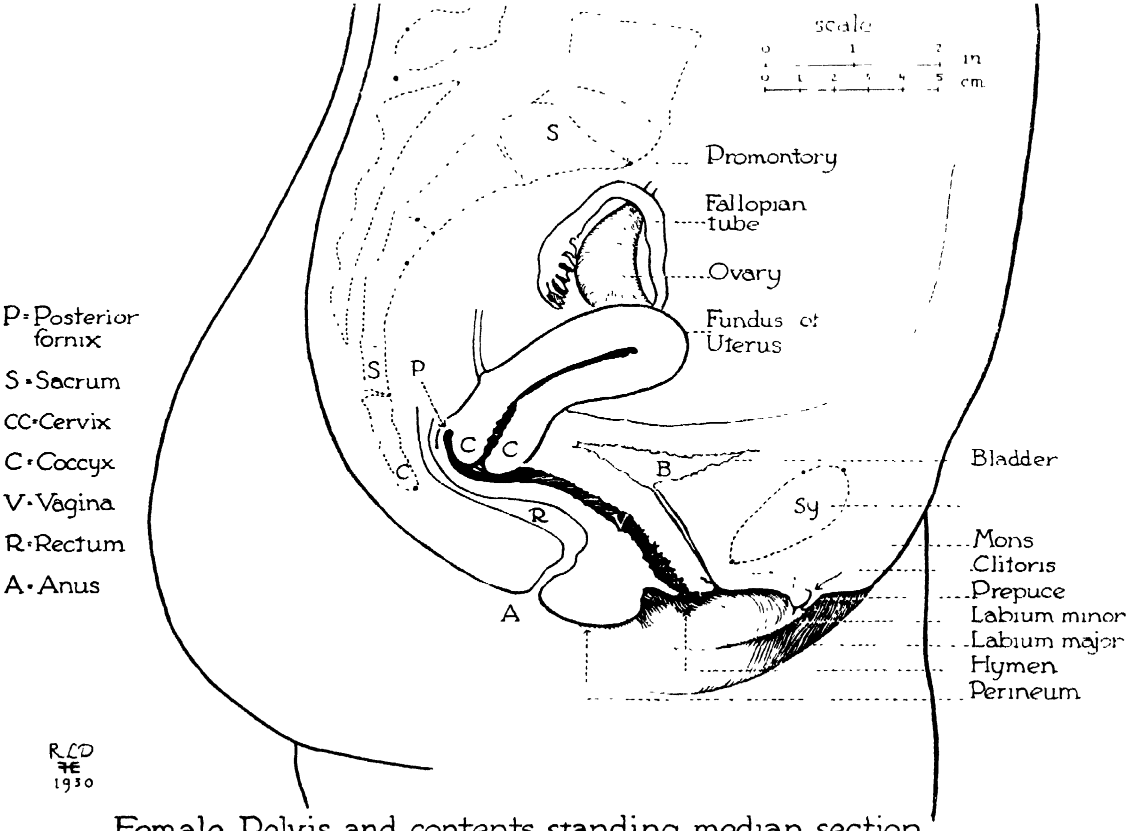
THE BONY PELVIS

Text and commentary pages 12 to 17
Figures 2 to 12a



Cavity of the bony pelvis standing, median section

Fig. 2



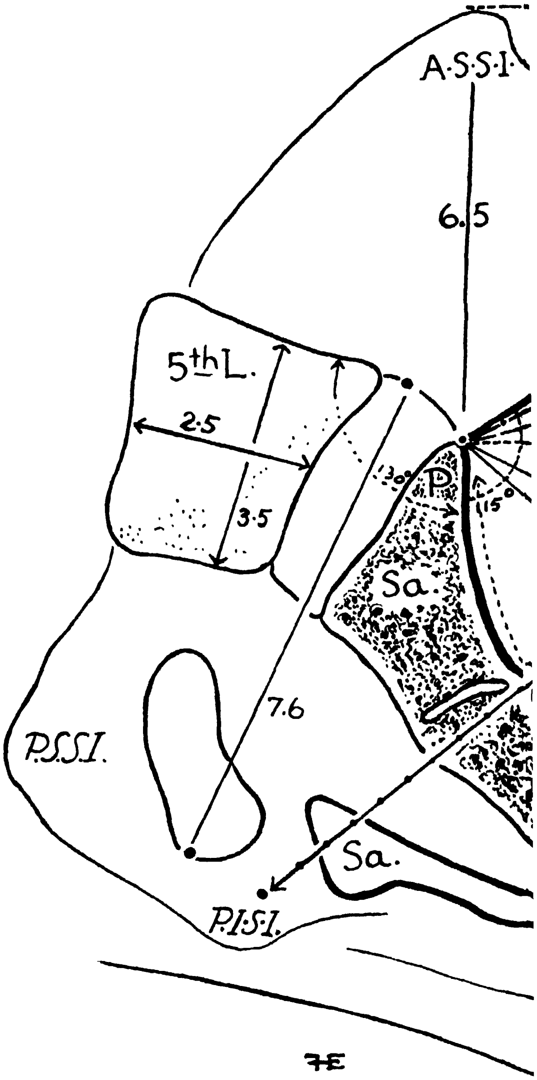
Female Pelvis and contents, standing, median section

Fig.

Female Pelvis. Angles and D

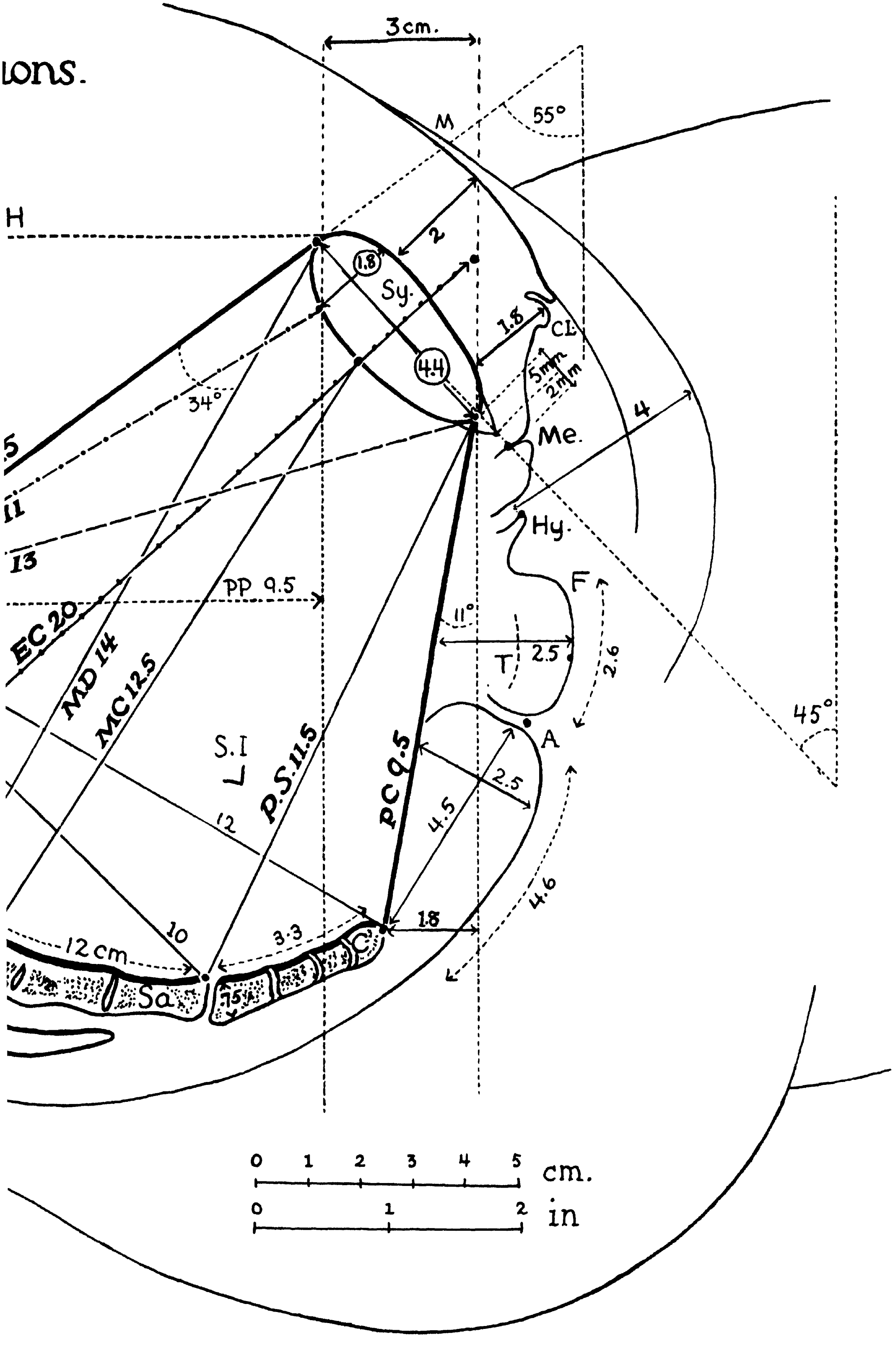
Legs extended.

A = Anus
A·S·S·I· = Anterior-Superior Spine of Ileum
C = Coccyx
CL = Clitoris (to meatus, 2·5)
D·C· = Diagonal Conjugate.
E·C· = External Conjugate.
F. = Fourchette
H = Horizontal from crest of ileum to symphysis.
Hy · hymen
M = Mons
M·C· = Median Conjugate
Me = Meatus
O·C· = Obstetric Conjugate
P. = Promontory
P·C· = Pubo-coccygeal diameter or Outlet
P.P. · Perpendicular from Promontory
P·S· = Pubo-sacral conjugate.
P.I.S.I. = Posterior inferior Spine of Ileum
P.S.S.I. = Posterior Superior Spine of Ileum
Sa · Sacrum
S·I· = Spine of Ischium
Sy = Symphysis
T = Tuberosity of Ischium
T·C· = True Conjugate or Inlet.



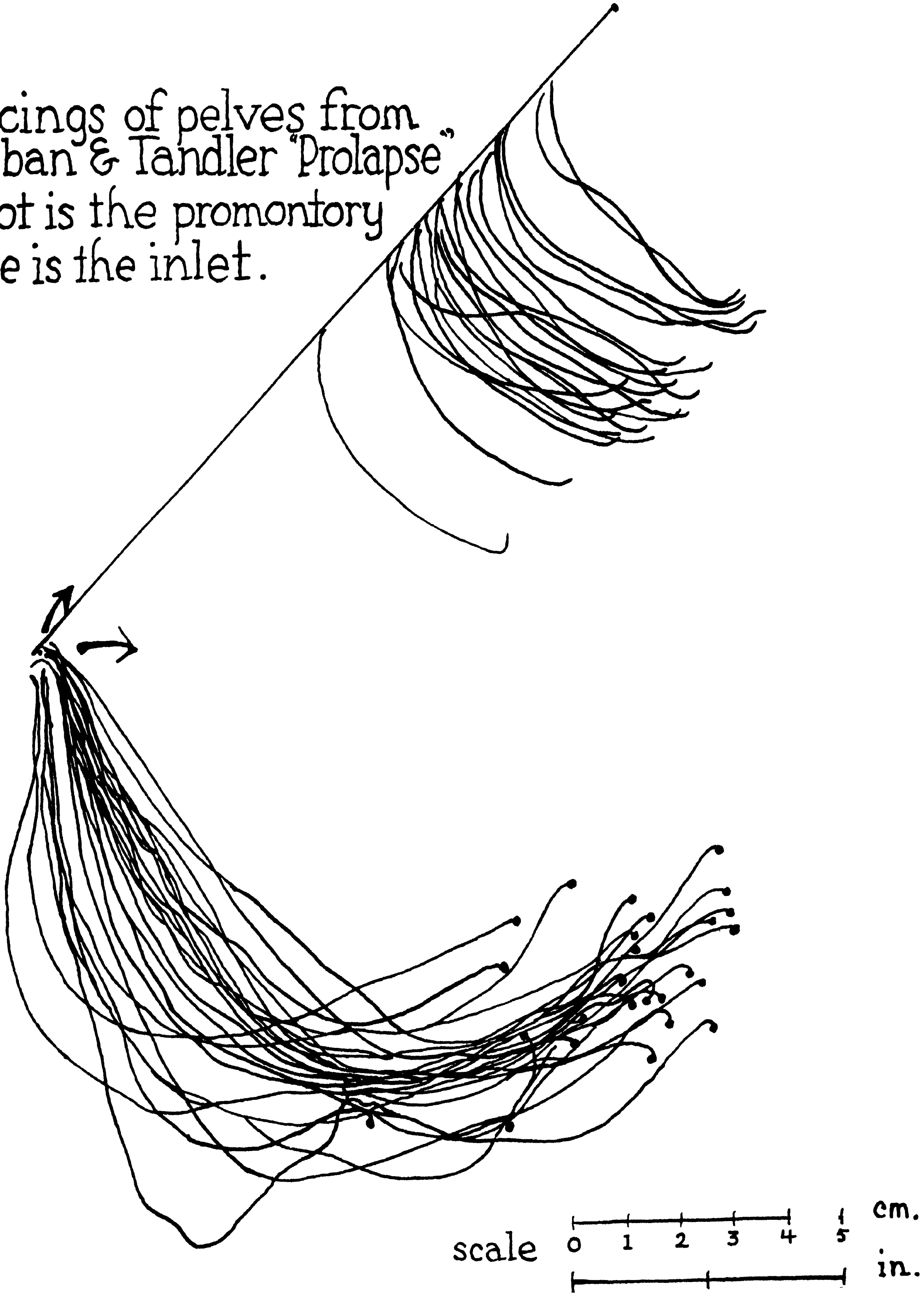
R. L. Dickinson
(a fifty year study)

ions.

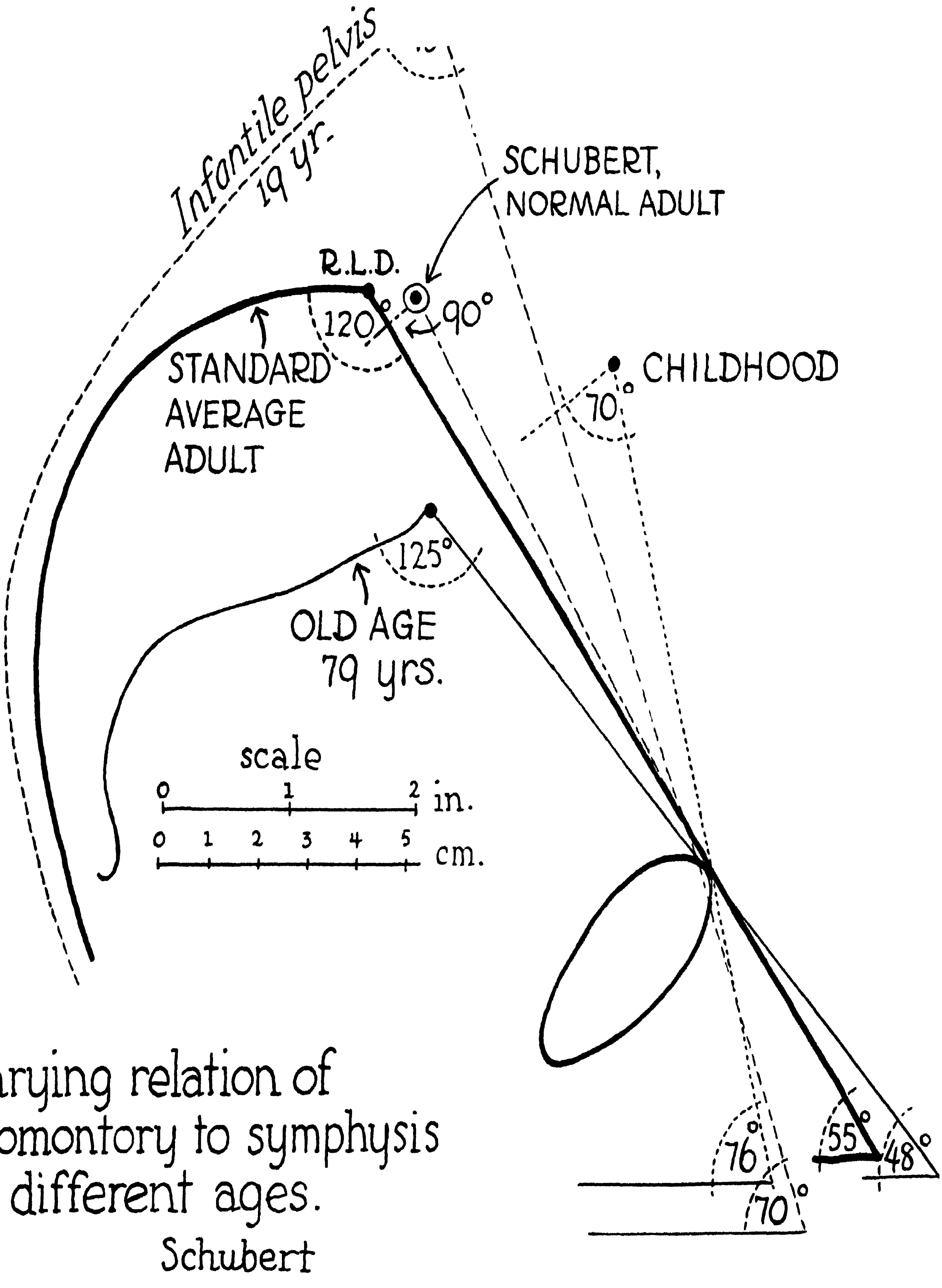


3cm.
M
55°
H
2
1.8
Sy.
4.4
1.8
CL
5mm
2mm
Me.
4
5
34°
11
13
Hy.
PP 9.5
F
EC 20
11°
MD 14
2.5
T
2.6
MC 12.5
45°
A
S.I
P.S 11.5
PC 9.5
2.5
4.5
12
4.6
10
3.3
1.8
12 cm
C
Sa
75°
0 1 2 3 4 5 cm.
0 1 2 in

Fig.



Tracings of pelves from Halban & Tandler "Prolapse"
Pivot is the promontory
Base is the inlet.



Varying relation of promontory to symphysis at different ages.

Schubert

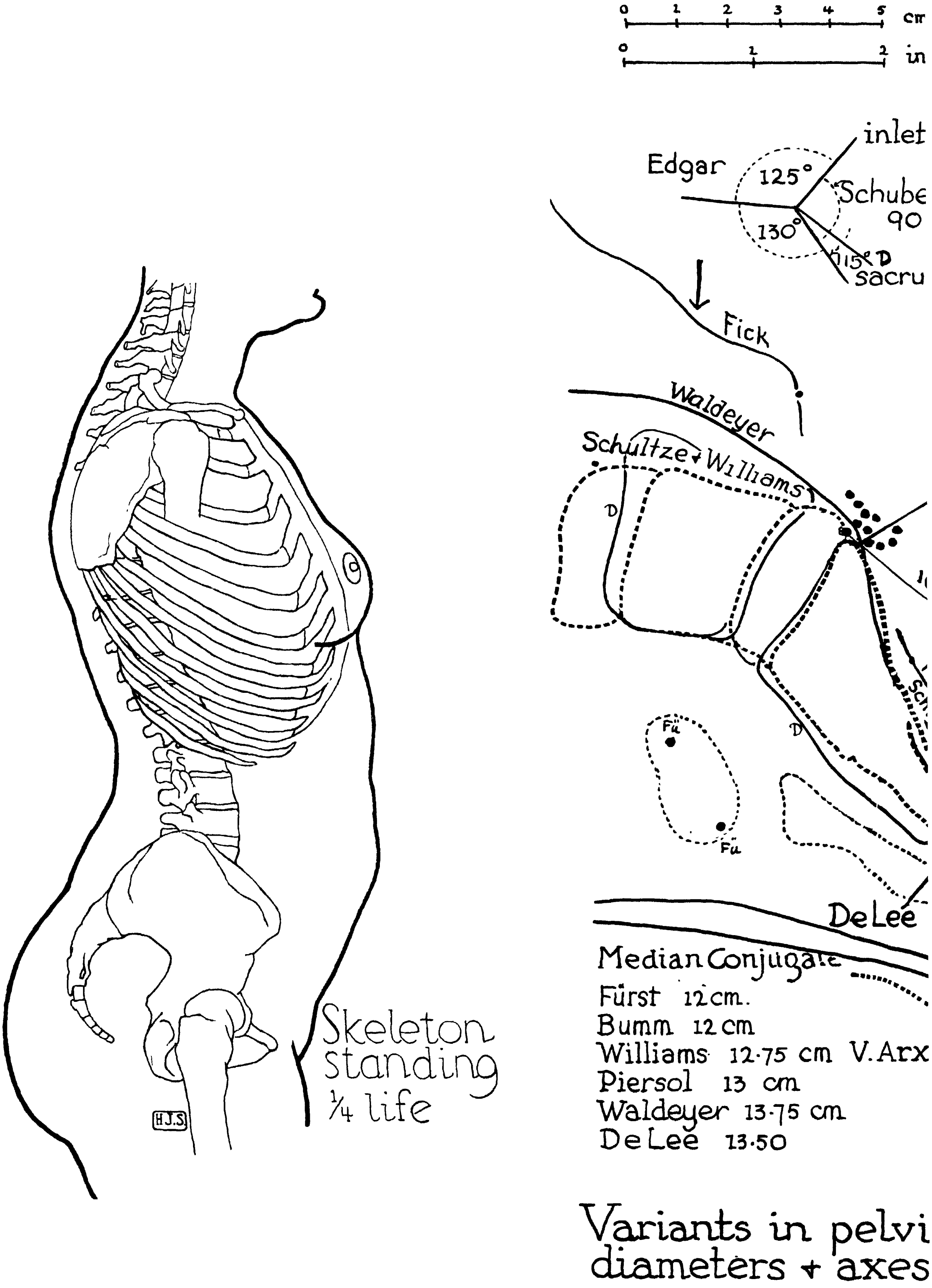

0 1 2 3 4 5 cm
0 1 2 in
inlet
Edgar
125°
Schube
90
130°
115° D
sacru
Fick
Waldeyer
Schultze + Williams
D
D
Fü
Fü
Sch
De Lee
Median Conjugate
Fürst 12 cm.
Bumm 12 cm
Williams 12·75 cm V. Arx
Piersol 13 cm
Waldeyer 13·75 cm
De Lee 13·50
Skeleton standing ¼ life
H.J.S.
Variants in pelvi diameters + axes

Fig. 7a

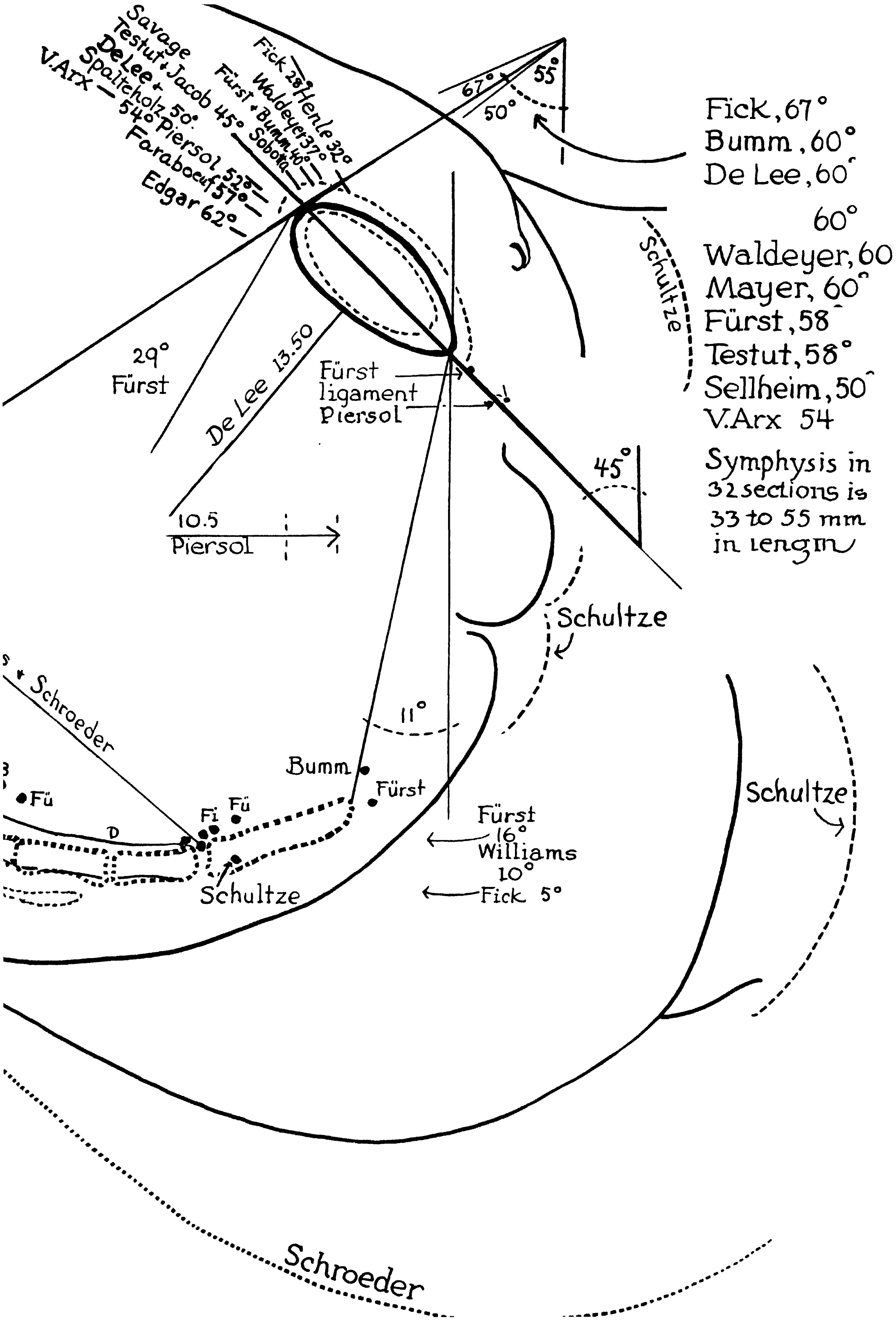

Savage
Testut + Jacob 45°
De Lee + Spalteholz 50°
V. Arx — 54°
Piersol 52°
Faraboeuf 57°
Edgar 62°
Fick 28°
Henle 32°
Waldeyer 37°
Fürst + Bumm 40°
Sobotta
67°
55°
50°
Fick, 67°
Bumm, 60°
De Lee, 60°
60°
Waldeyer, 60
Mayer, 60°
Fürst, 58°
Testut, 58°
Sellheim, 50°
V. Arx 54
Symphysis in 32 sections is 33 to 55 mm in length
Schultze
29°
Fürst
De Lee 13.50
Fürst ligament
Piersol
45°
10.5
Piersol
Schultze
11°
Schroeder
Bumm
Fürst
Fü
Fi
Fü
D
Schultze
Fürst 16°
Williams 10°
Fick 5°
Schultze
Schroeder

Fig. 7b

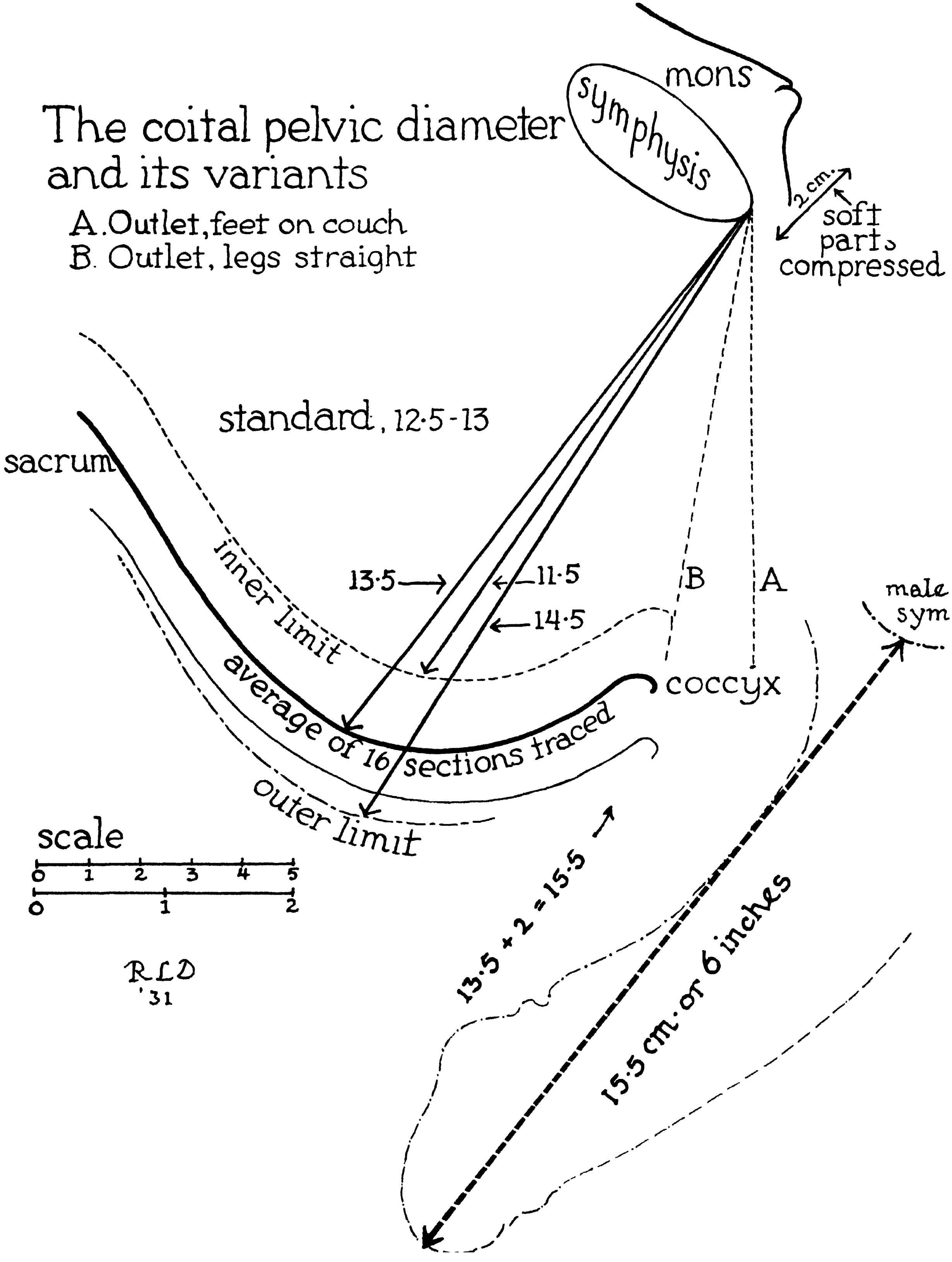
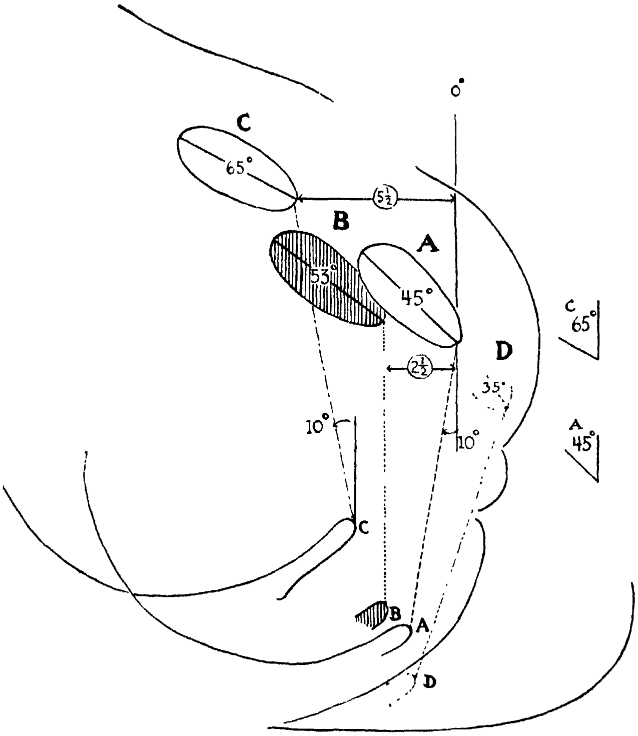
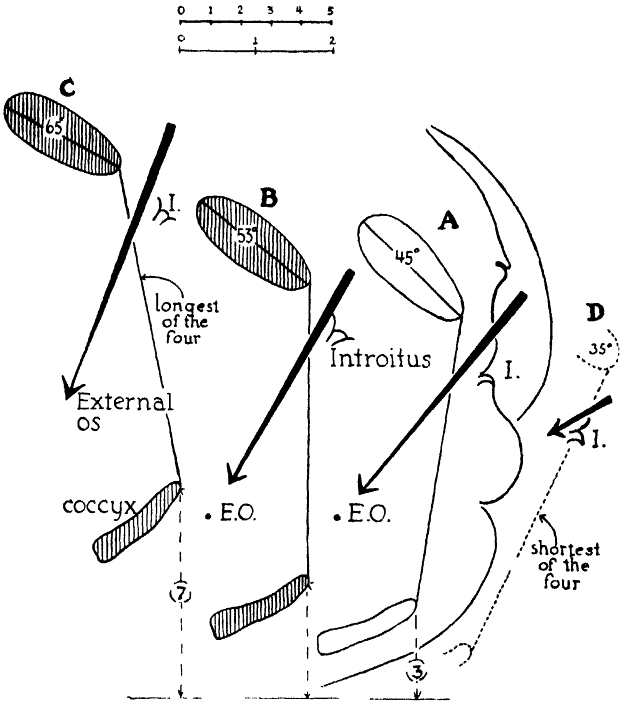

The coital pelvic diameter and its variants
A. Outlet, feet on couch
B. Outlet, legs straight
mons
symphysis
2 cm.
soft parts compressed
standard, 12·5-13
sacrum
inner limit
13·5
11·5
14·5
B
A
male sym
coccyx
average of 16 sections traced
outer limit
scale
0 1 2 3 4 5
0 1 2
13·5 + 2 = 15·5
15·5 cm. or 6 inches
RLD
'31

Fig. 8

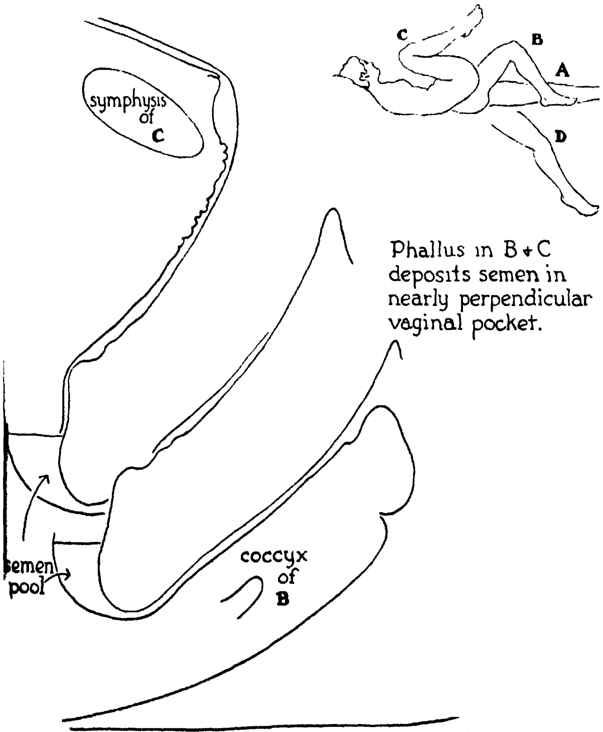


Changes in pelvic axes in various supine postures

A. Legs on couch, straight out
B. Knees bent, feet on couch, usual posture
C Thighs against trunk.
D Thighs hanging down.

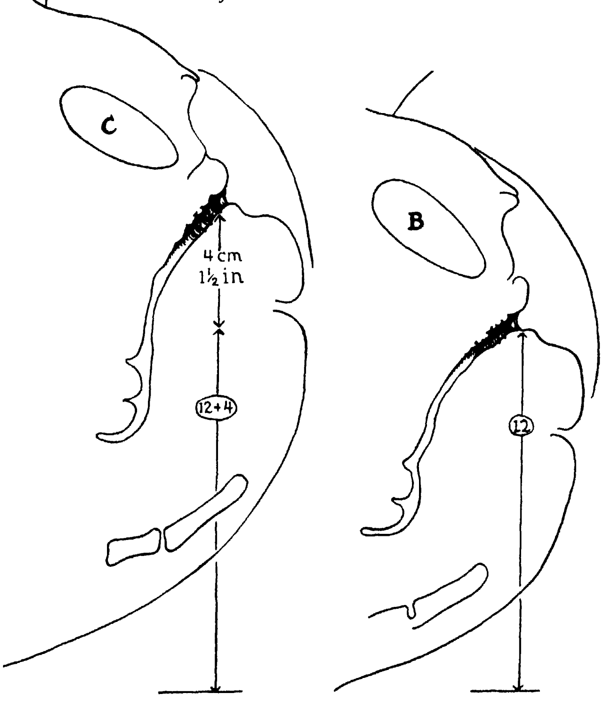


Axes of



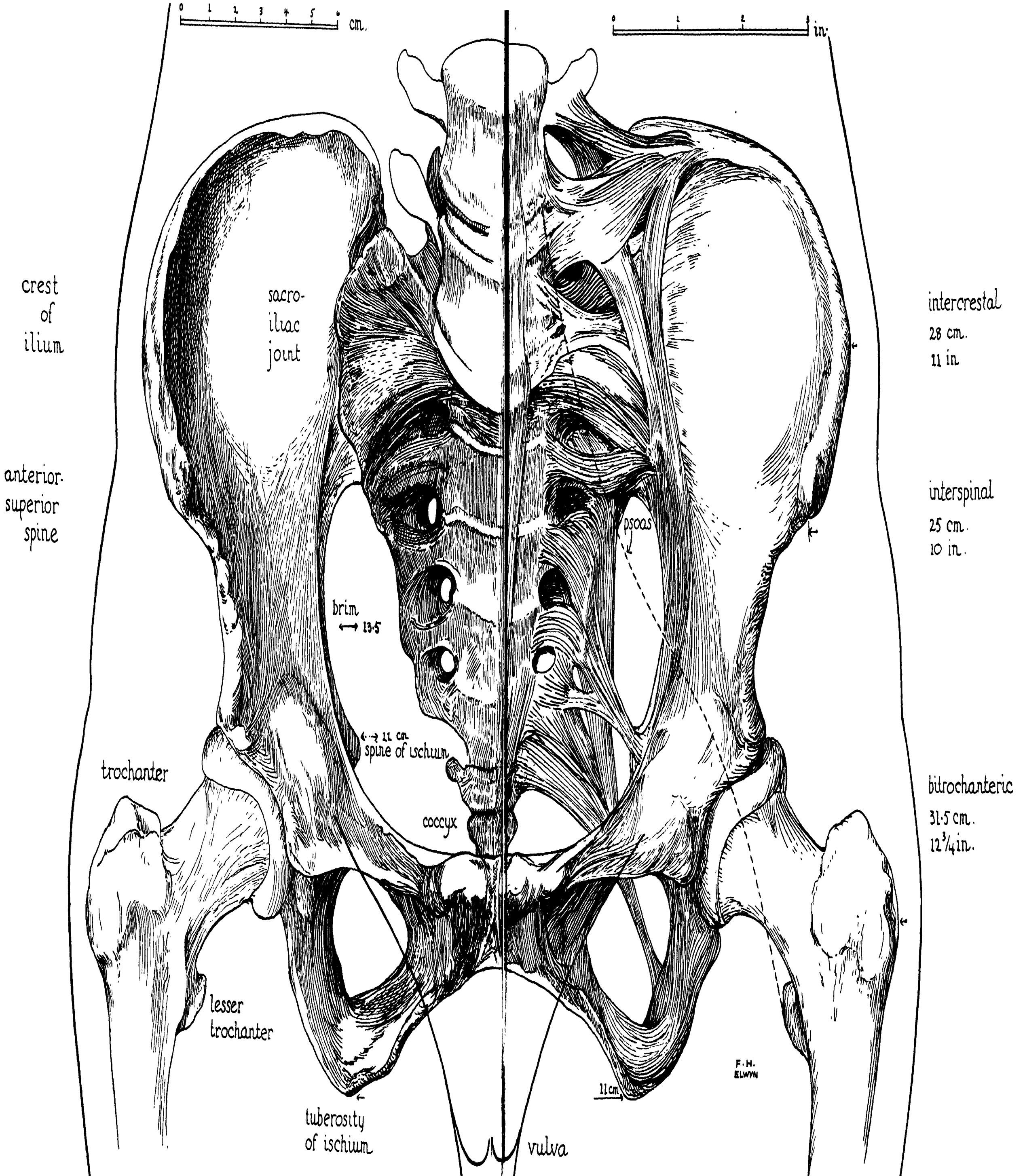
Phallus in B + C deposits semen in nearly perpendicular vaginal pocket.

Vulva higher and more accessible with thighs flexed



Variations in vulva, vagina and pelvis in supine postures.

Fig. 9



Pelvis from front

Point of view for most Roentgengrams of tubes and uterus.

Fig. 10

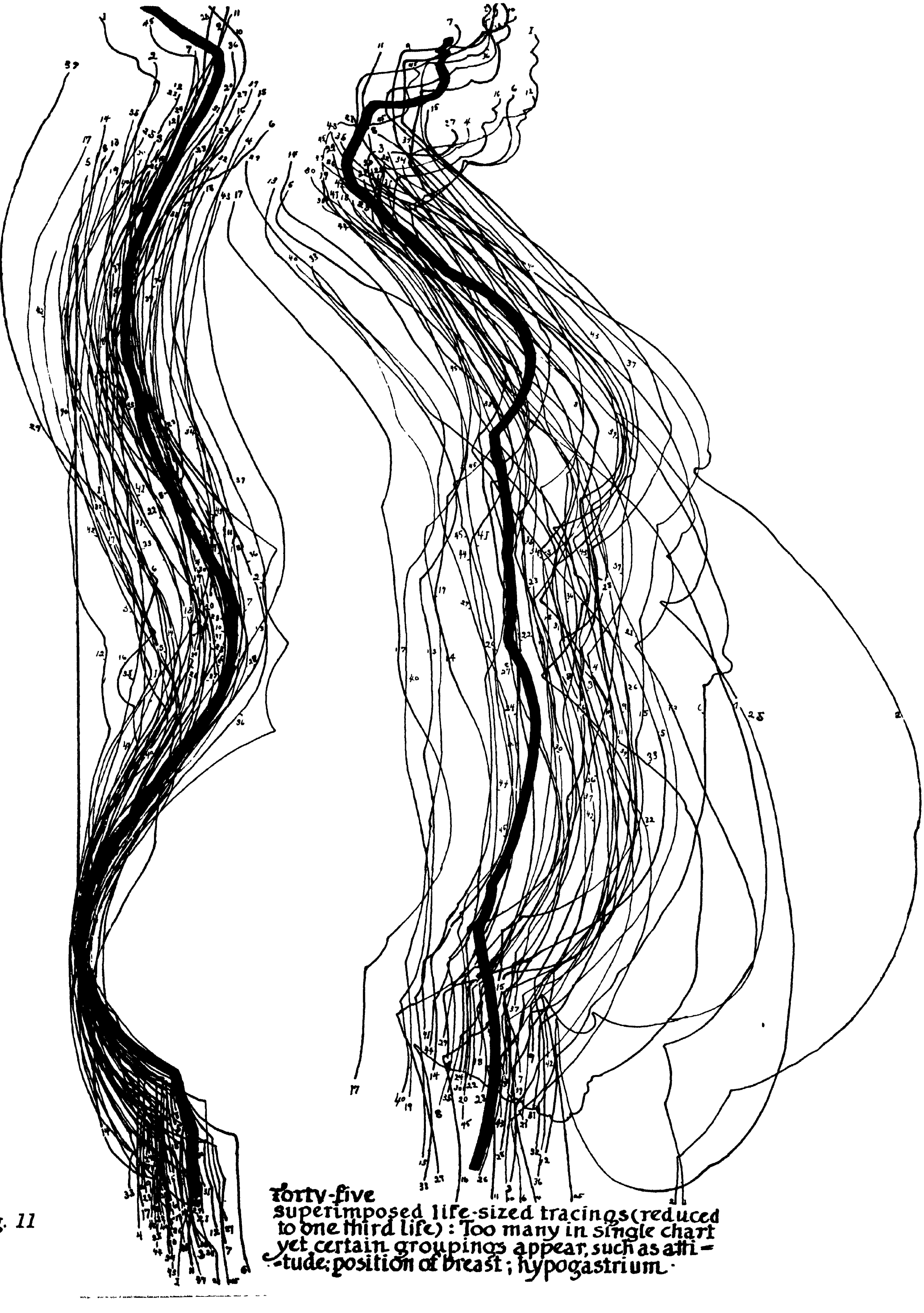
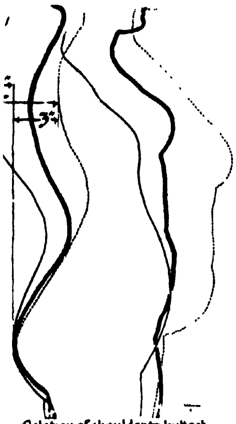
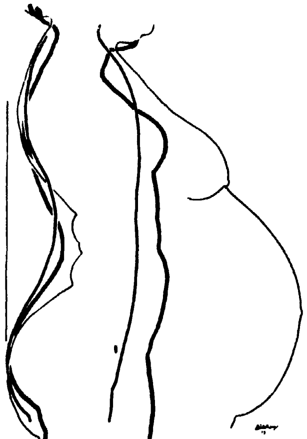


Fig. 11

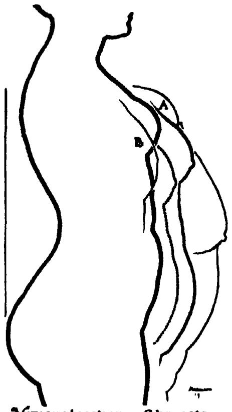
Forty-five superimposed life-sized tracings (reduced to one third life): Too many in single chart yet certain groupings appear, such as atti-tude; position of breast; hypogastrium.



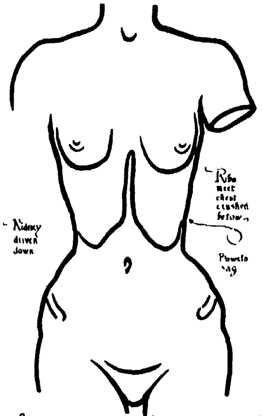
Relation of shoulder to buttock
and to tilt of pelvic inlet and outlet



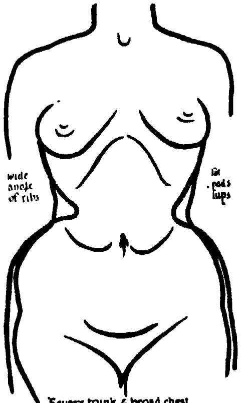
Lumbar curve increased by weight
on anterior abdominal wall pelvis tipped forward



Various locations of breasts
A. corset lift B. brassiere flattening



Long trunk narrow chest sag of breast & bowel
with retroversion & prolapse often



Square trunk & broad chest
(corset study before 1911)

long trunk

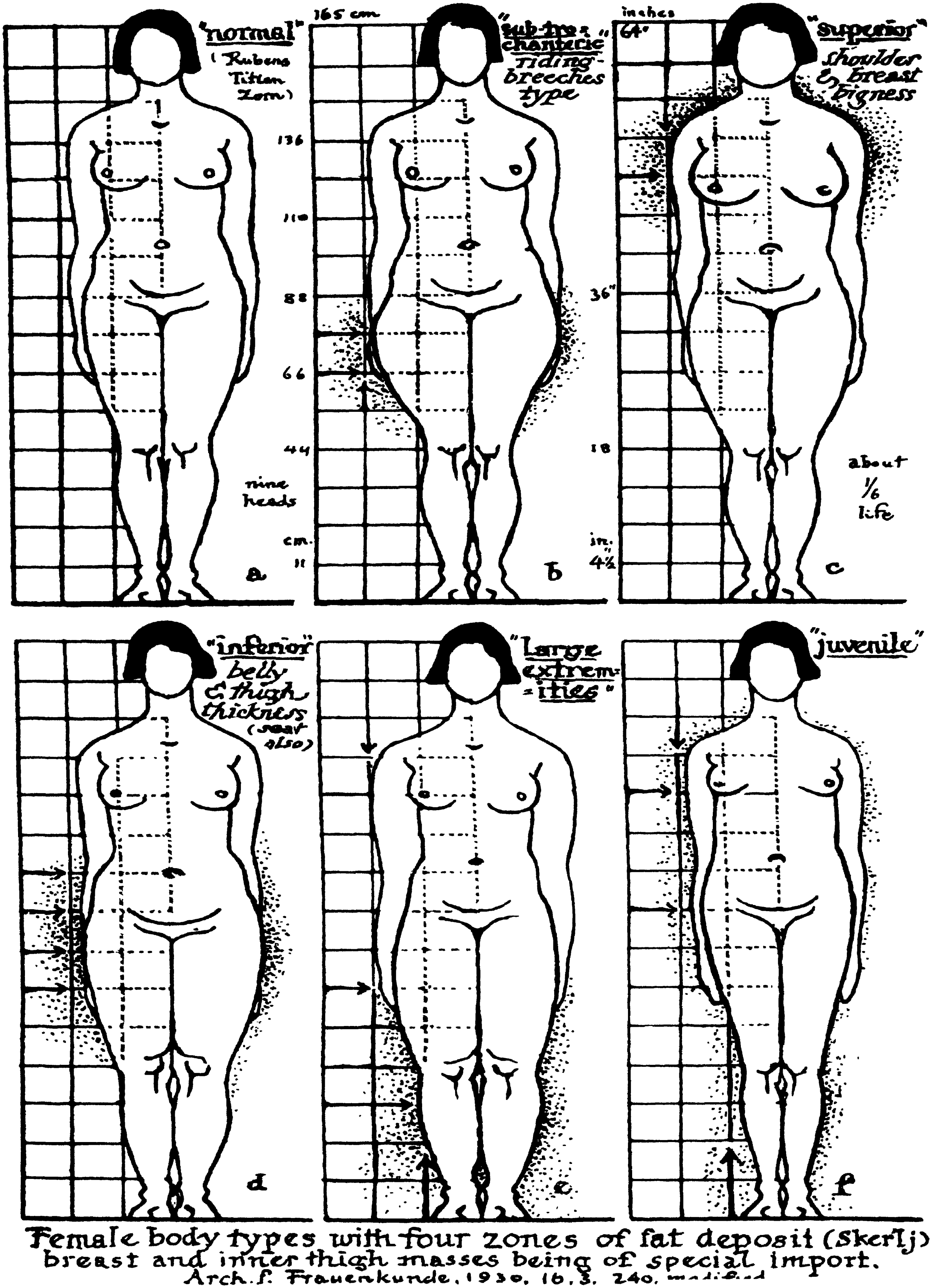
square trunk

brassiere deformity

infantile

Postures and Body Forms

Fig. 12

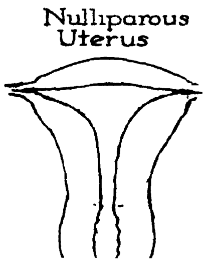


Female body types with four zones of fat deposit (Skerlj)
breast and inner thigh masses being of special import.
Arch. f. Frauenkunde. 1930. 16. 3. 240. modified

CHAPTER III

UTERUS, OVARIES AND TUBES

Text and commentary pages 13 to 33
Figures 13 to 49


Nulliparous Uterus

Anteflexion

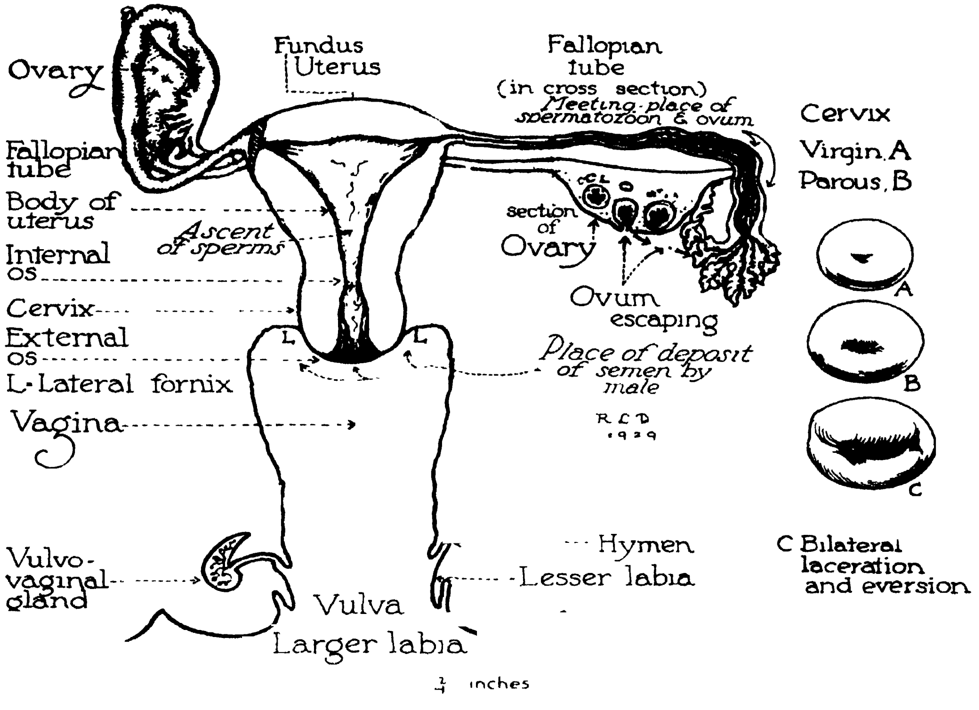
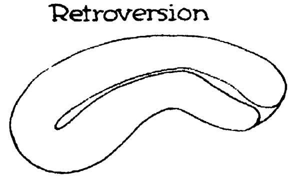
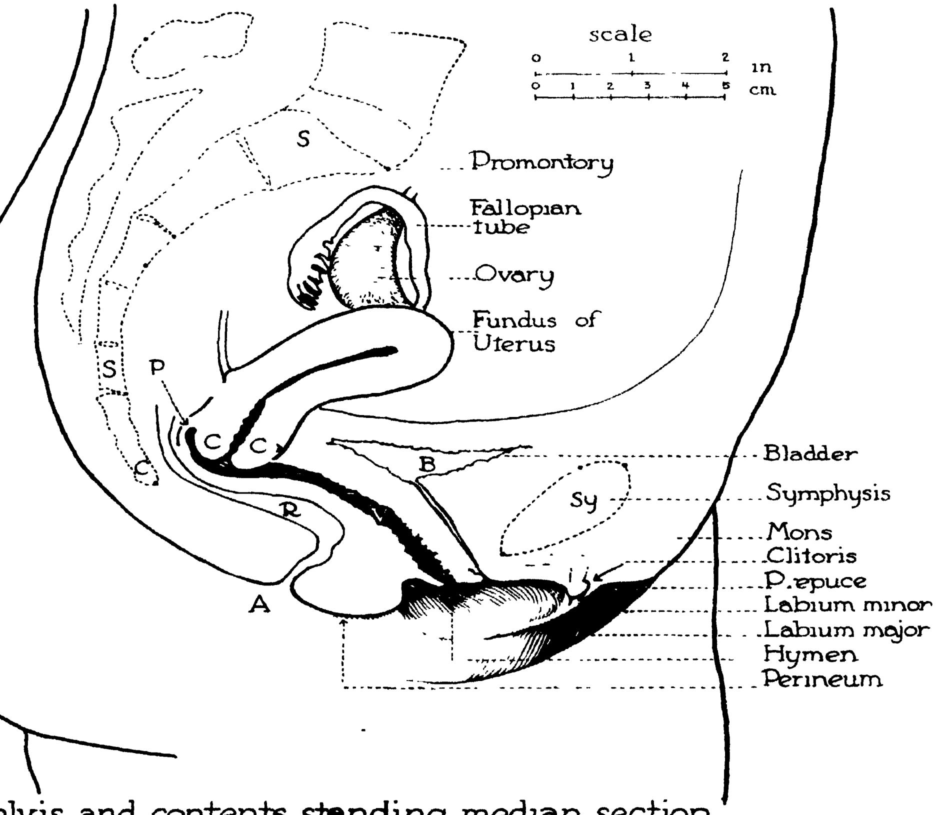
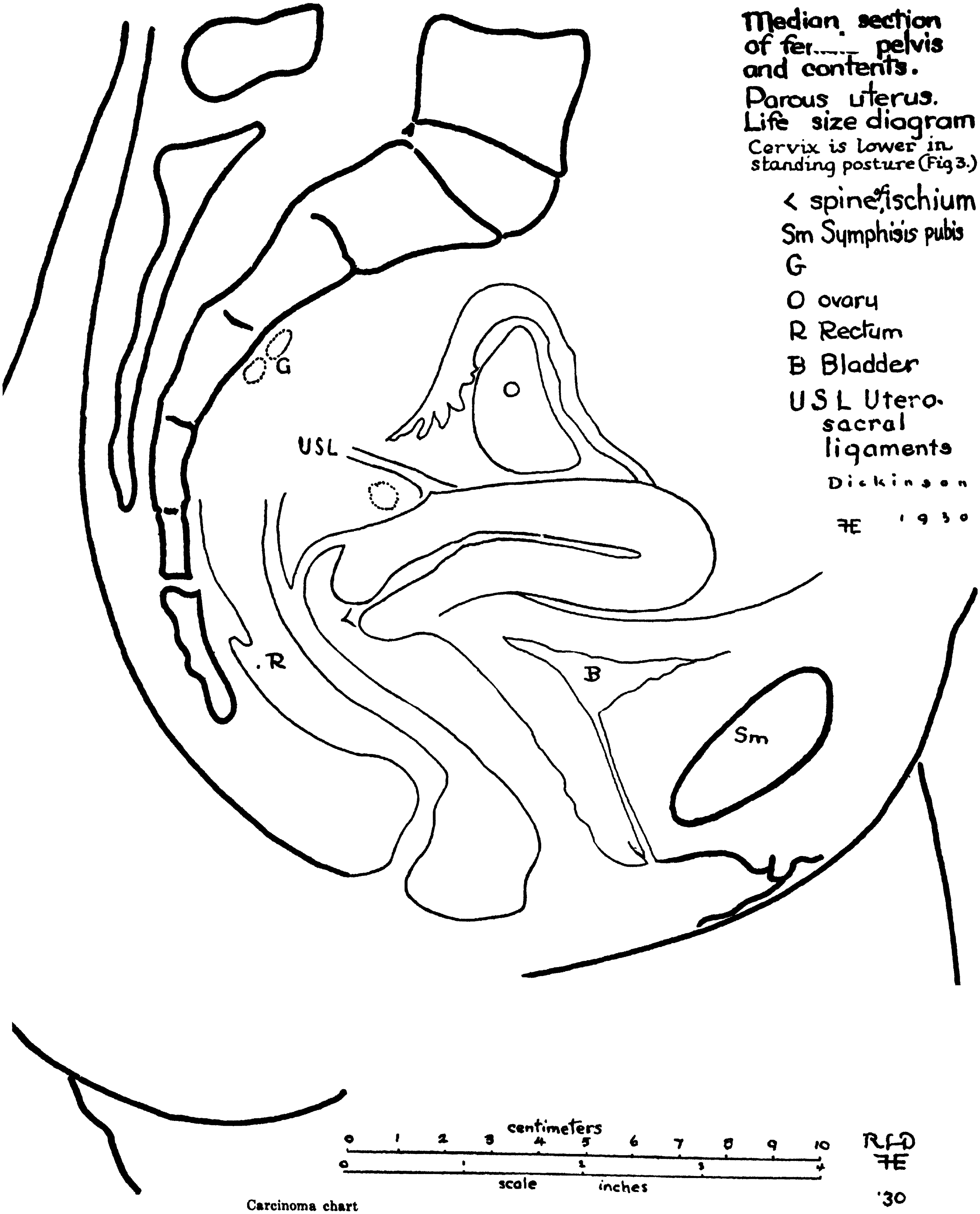


Diagram of internal genitals.


Retroversion



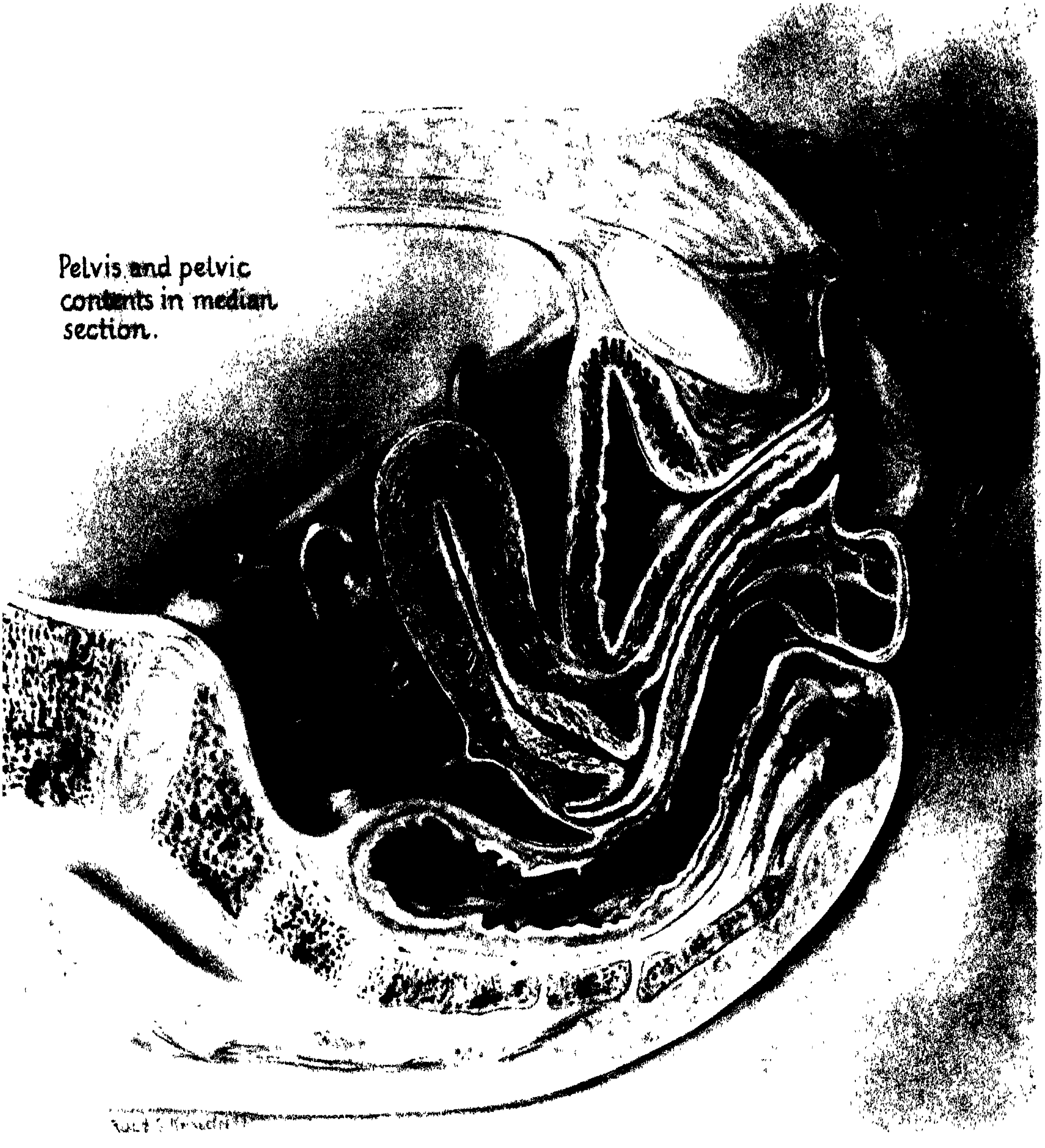
Female Pelvis and contents. standing, median section



Carcinoma chart

WOMAN'S HOSPITAL in the STATE of NEW YORK

g. 14 Name Record No.



Pelvis and pelvic contents in median section.

Fig. 15

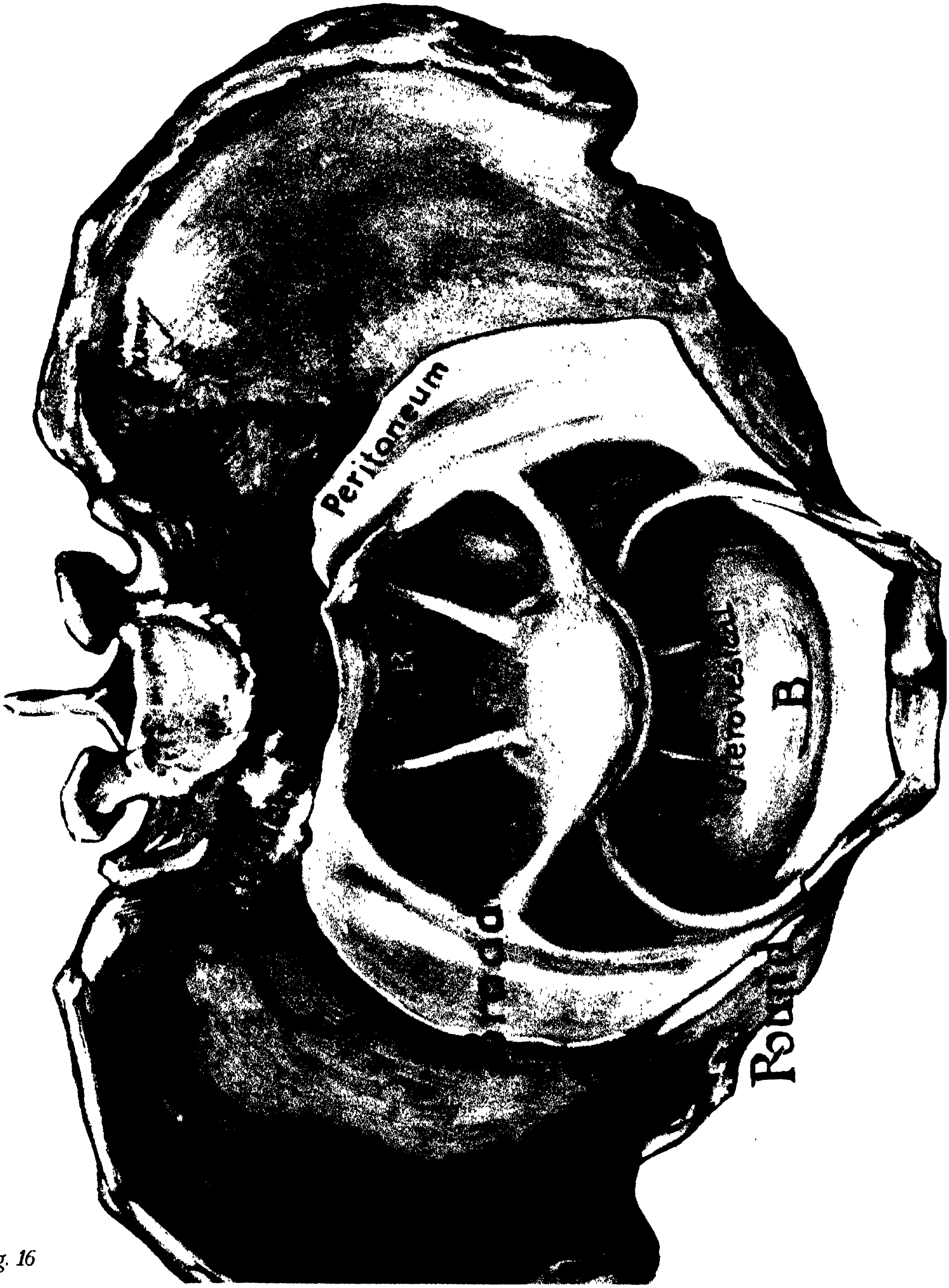


Fig. 16

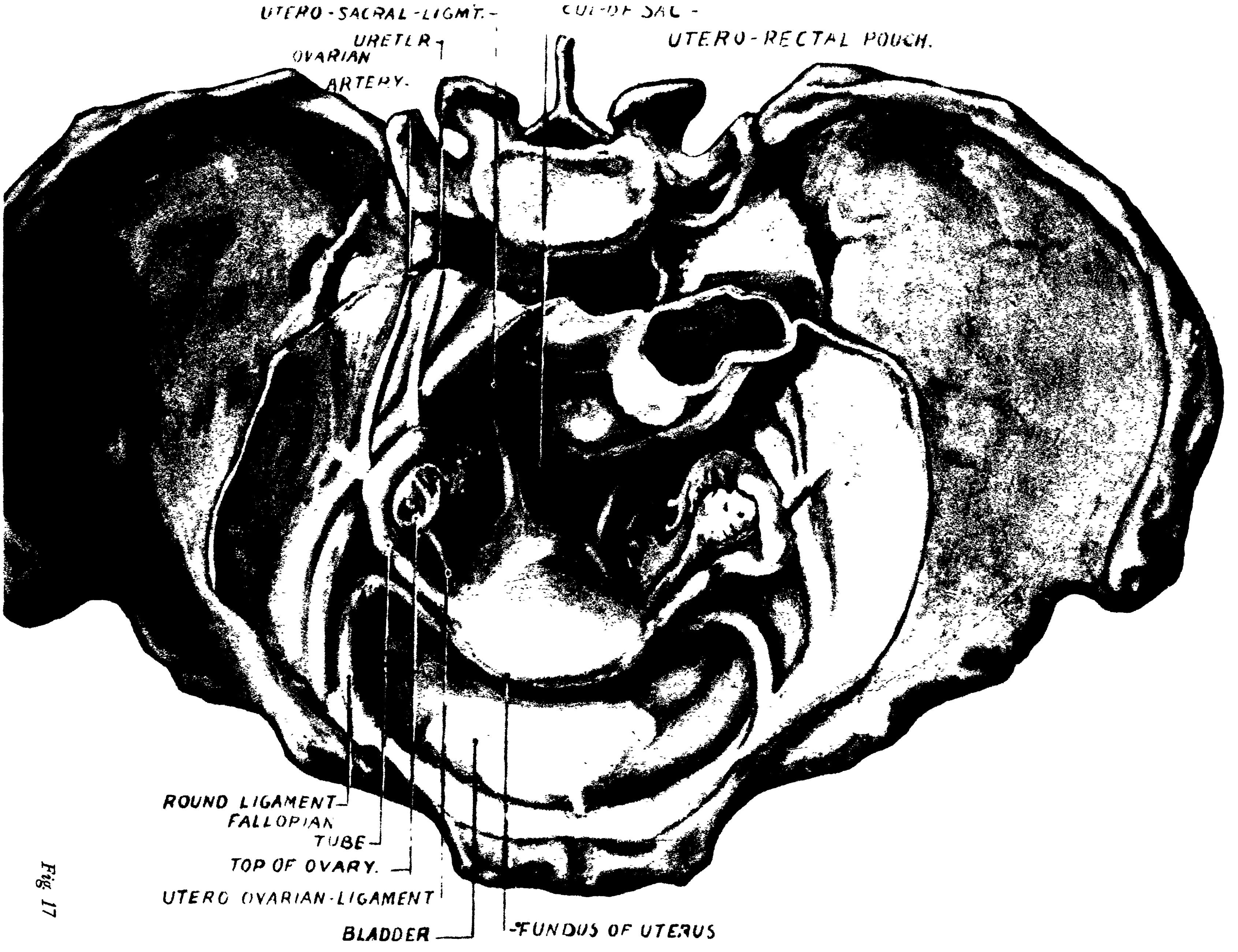
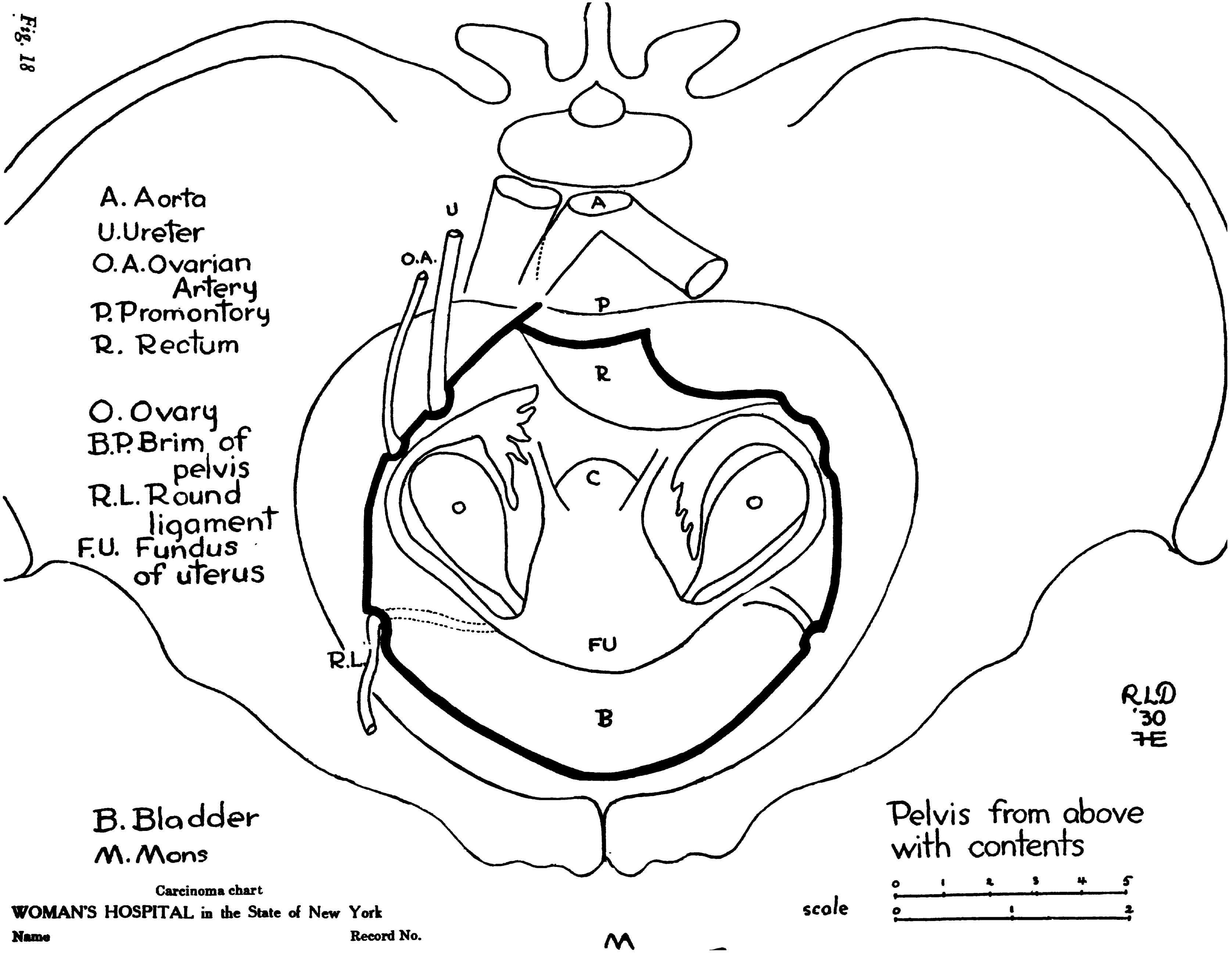
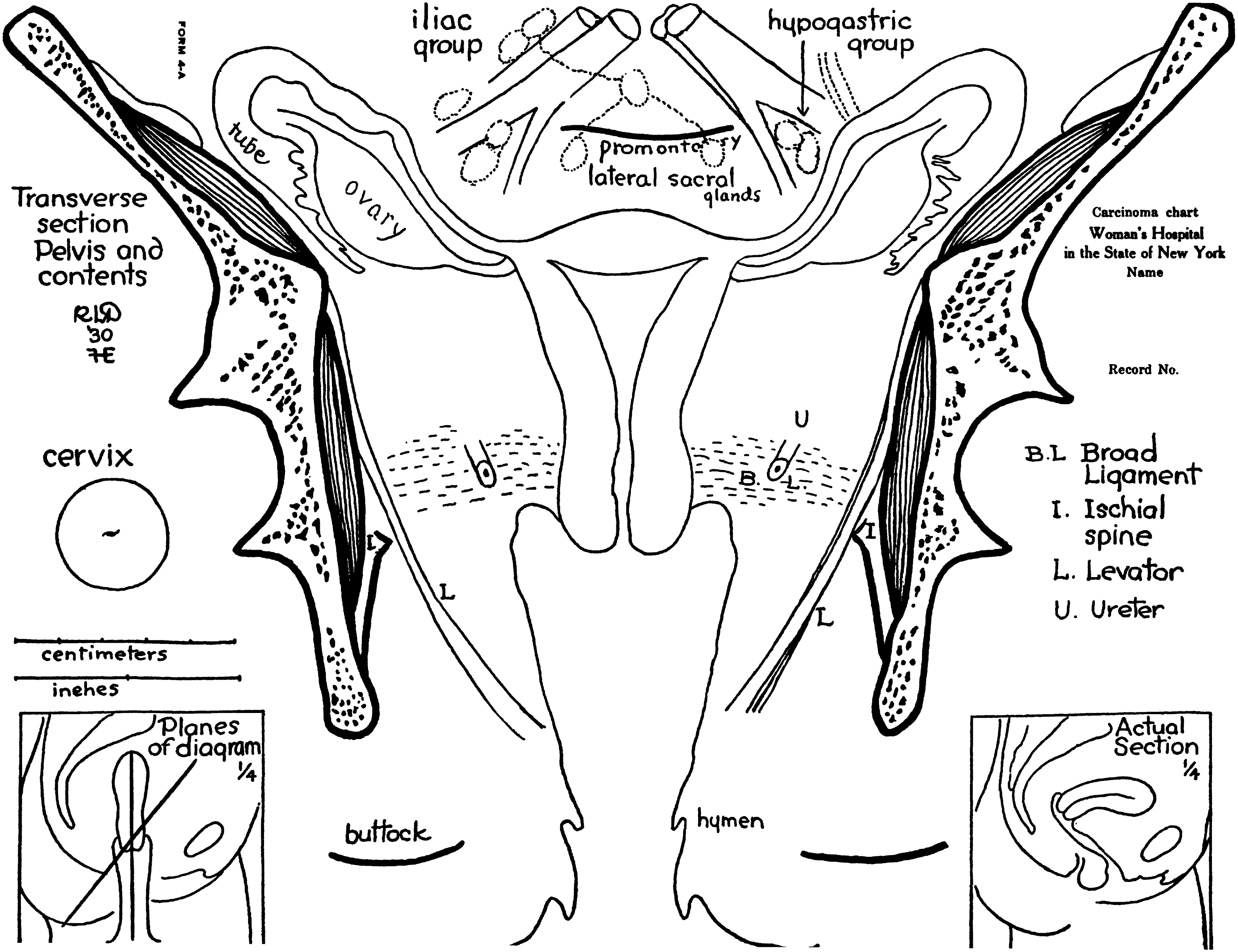

UTERO-SACRAL-LIGMT.-
CUL-DE-SAC -
UTERO-RECTAL POUCH.
URETER
OVARIAN ARTERY.
ROUND LIGAMENT
FALLOPIAN TUBE
TOP OF OVARY.
UTERO OVARIAN-LIGAMENT
BLADDER
FUNDUS OF UTERUS

Fig. 17

Fig. 18



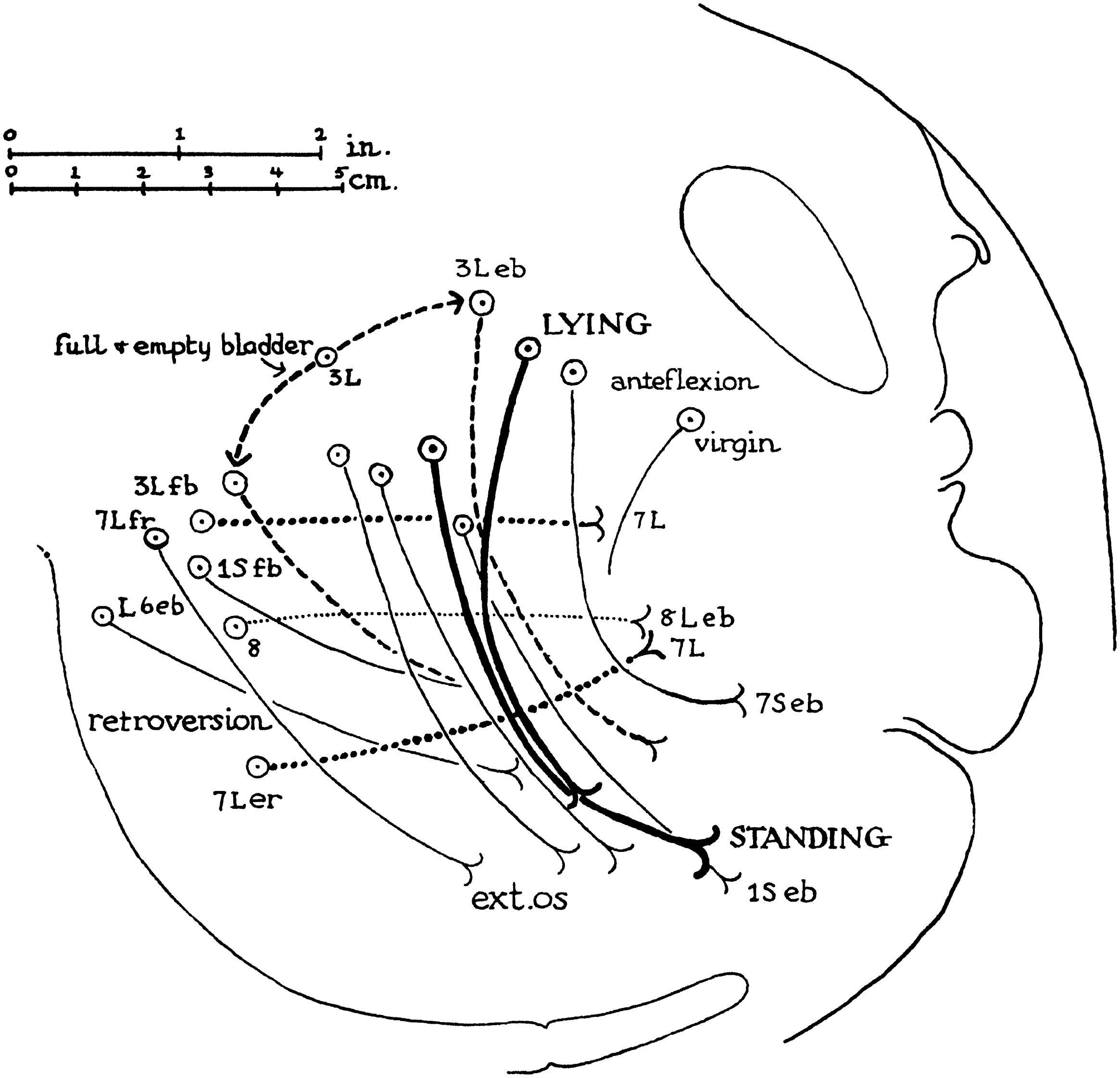
Carcinoma chart
WOMAN'S HOSPITAL in the State of New York
Name Record No.


FORM 4-A

Carcinoma chart
Woman's Hospital
in the State of New York
Name

Record No.

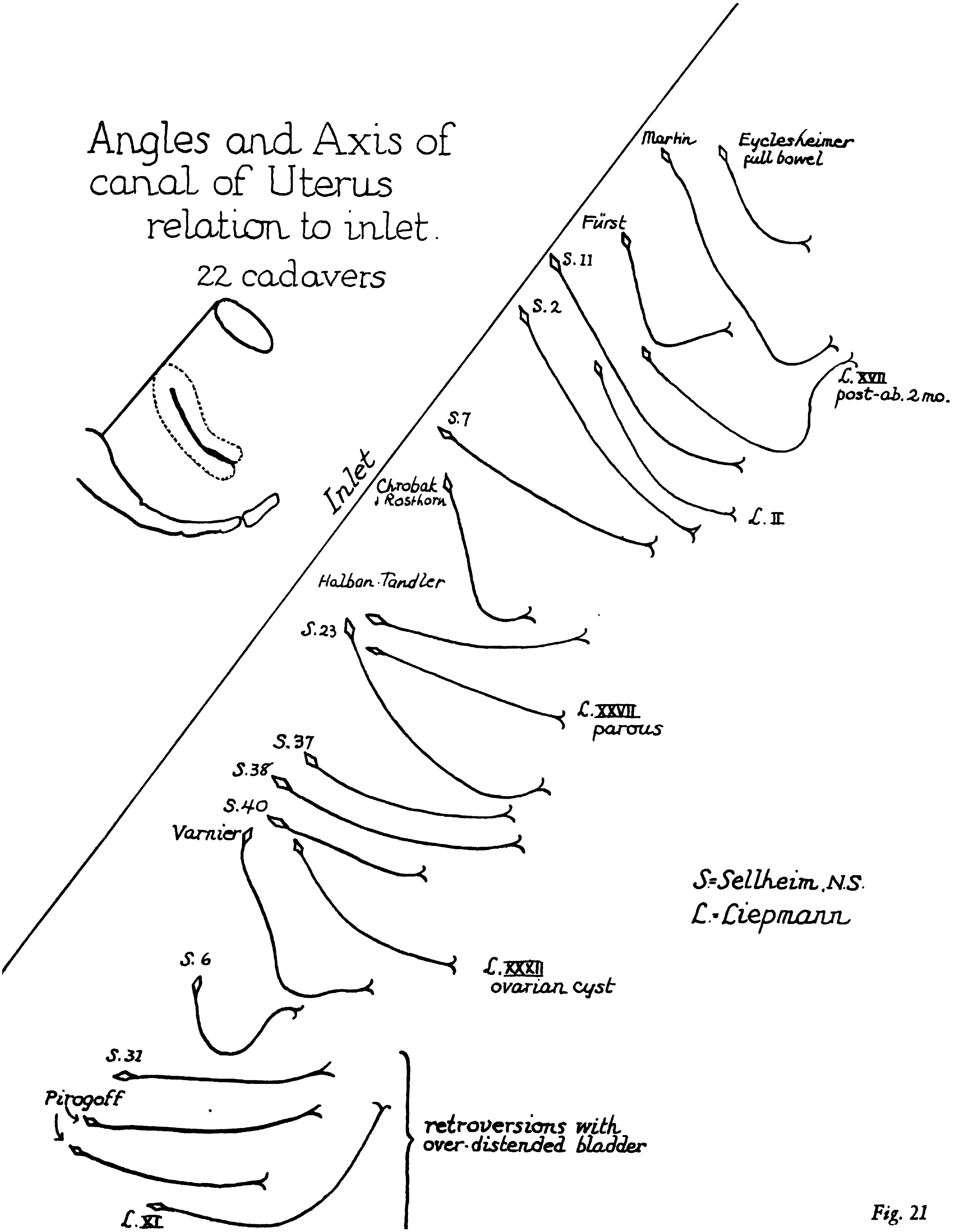
Fig. 10



S = Standing eb = empty bladder er = empty rectum
L = Lying fb = full bladder fr = full rectum
⊙ = top uterine cavity \ = Normal (R.L.D) Y = external os

Range of Uterus in the Living
Schubert's X-Rays. stem in Uterus
(selected from 100)
The Number refers to his figures

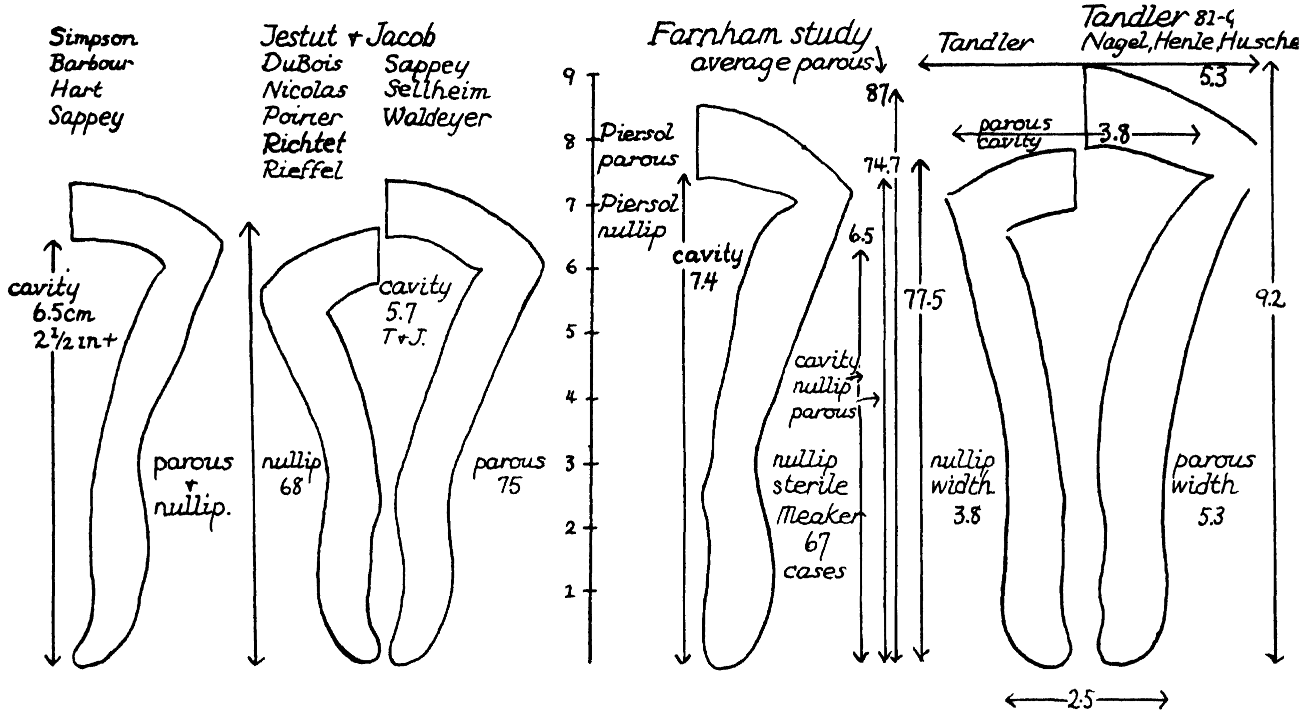
Fig. 20



Angles and Axis of canal of Uterus relation to inlet.

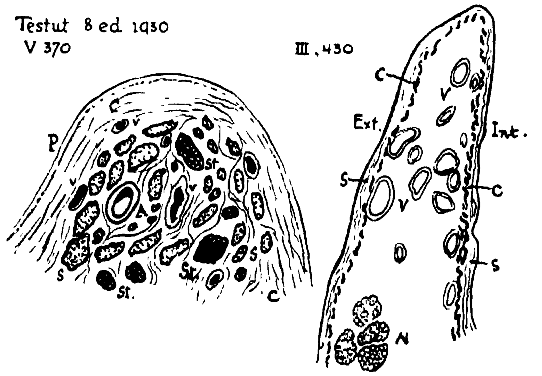
22 cadavers

Fig. 21



Size of Uterus

Fig 22*a*



Testut 8 ed. 1930
V 370

III, 430

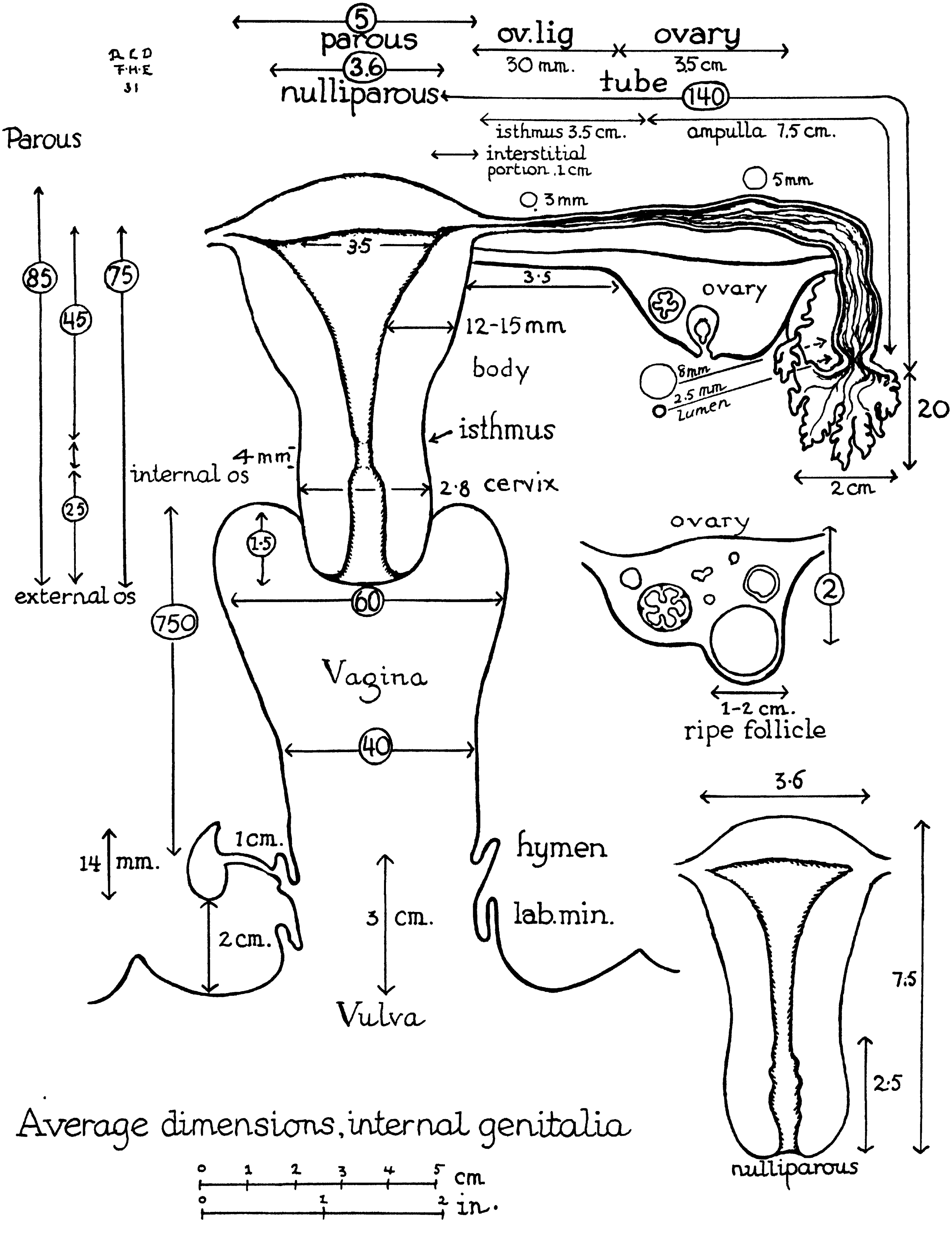
Transverse Section
of Round Ligament

P. = Peritoneum
A = Artery
V = Veins

Diagrammatic Sagittal
Section of Utero-sacral
Ligament

C = connective tissue
S = smooth muscle fibers
St = striated muscle fibers
N = nerves

Fig. 22*b*



Average dimensions, internal genitalia

Fig. 23

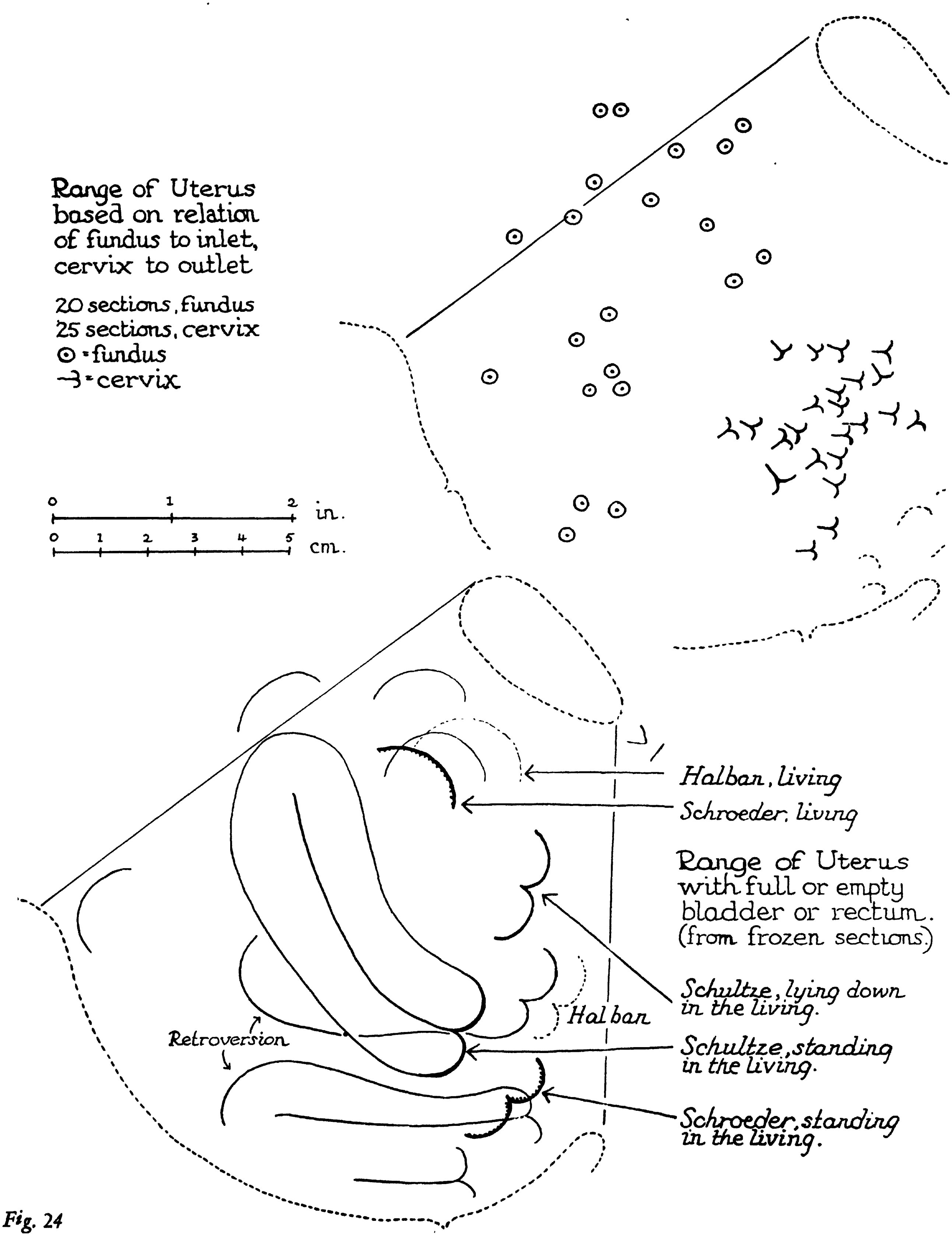

Range of Uterus based on relation of fundus to inlet, cervix to outlet
20 sections, fundus
25 sections, cervix
⊙ = fundus
⊰ = cervix
0 1 2 in.
0 1 2 3 4 5 cm.
Halban, living
Schroeder, living
Range of Uterus with full or empty bladder or rectum. (from frozen sections)
Schultze, lying down in the living.
Halban
Retroversion
Schultze, standing in the living.
Schroeder, standing in the living.

Fig. 24

Round ligament; location and range in 17 sections.
Uterus not displaced.

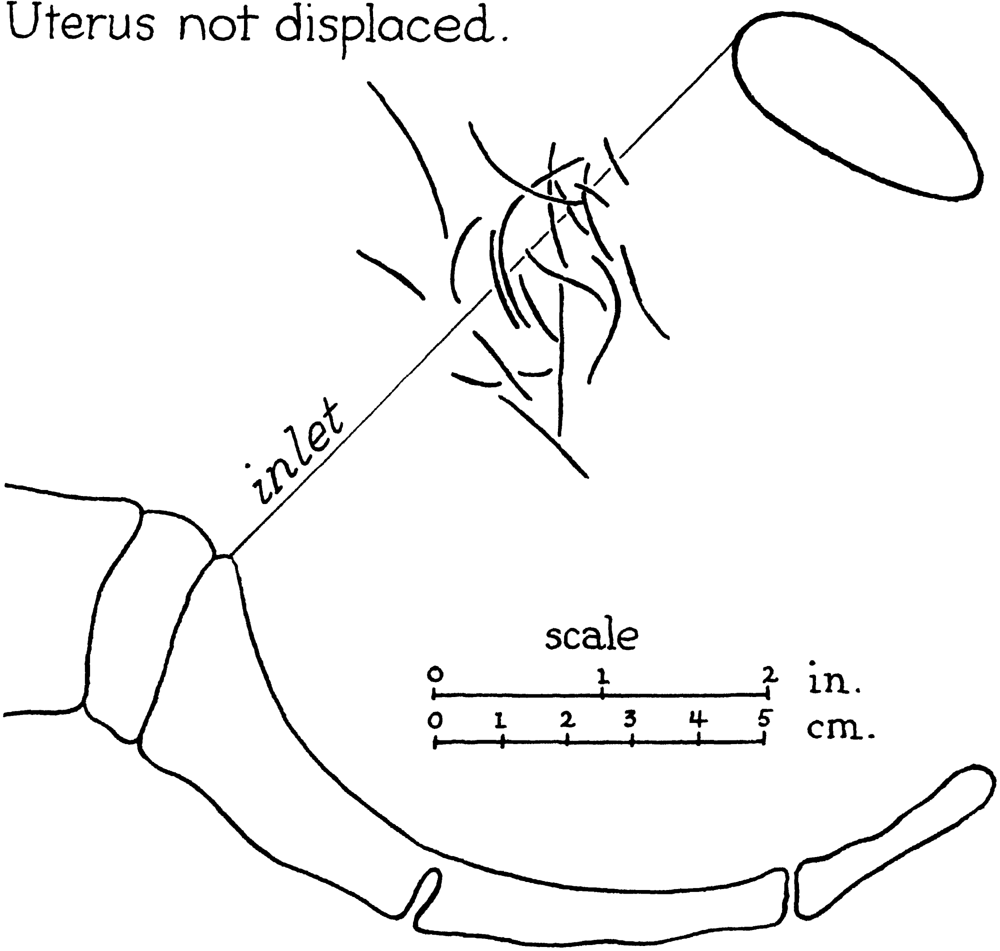


Fig. 25

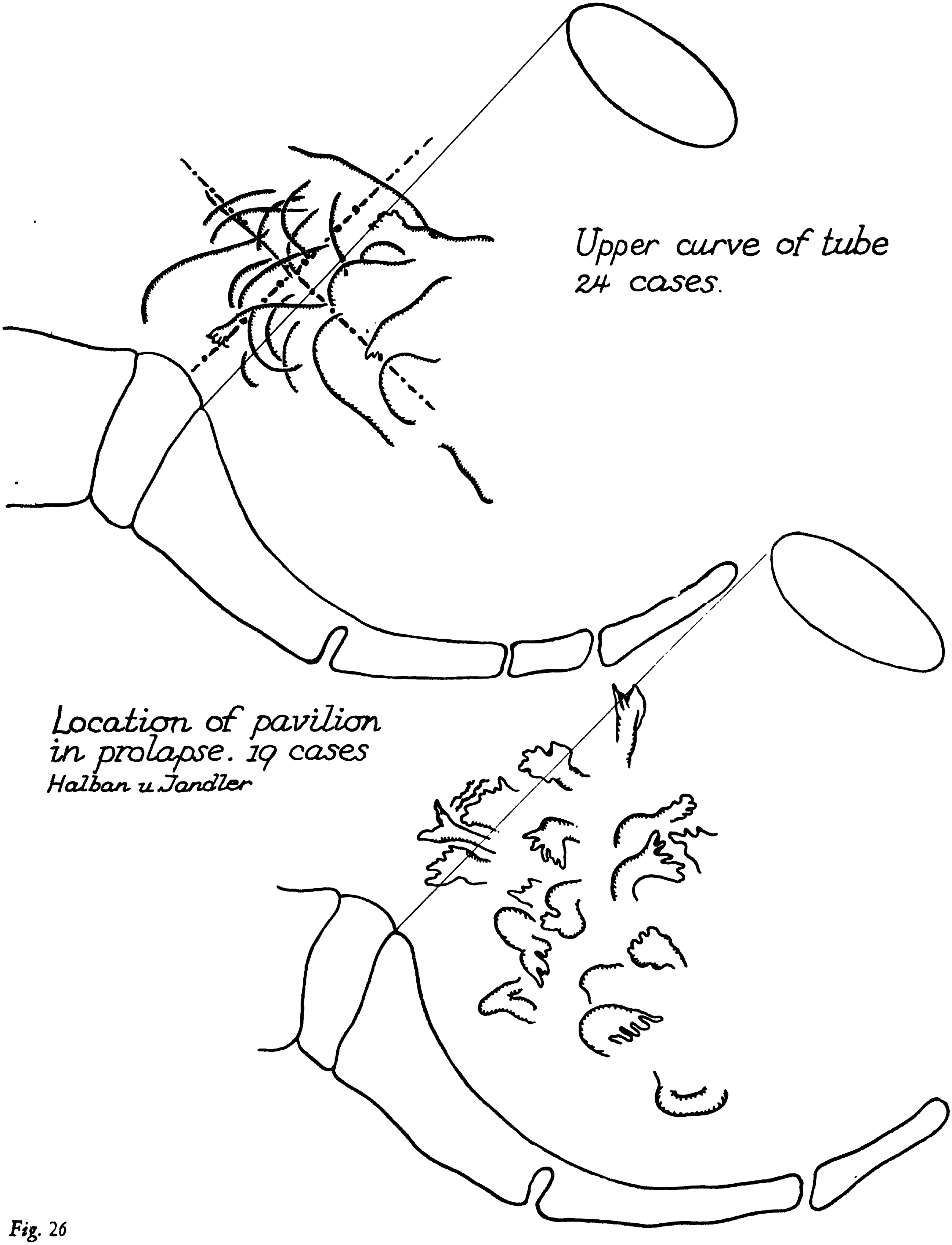

Upper curve of tube
24 cases.
Location of pavilion
in prolapse. 19 cases
Halban u. Jandler

Fig. 26

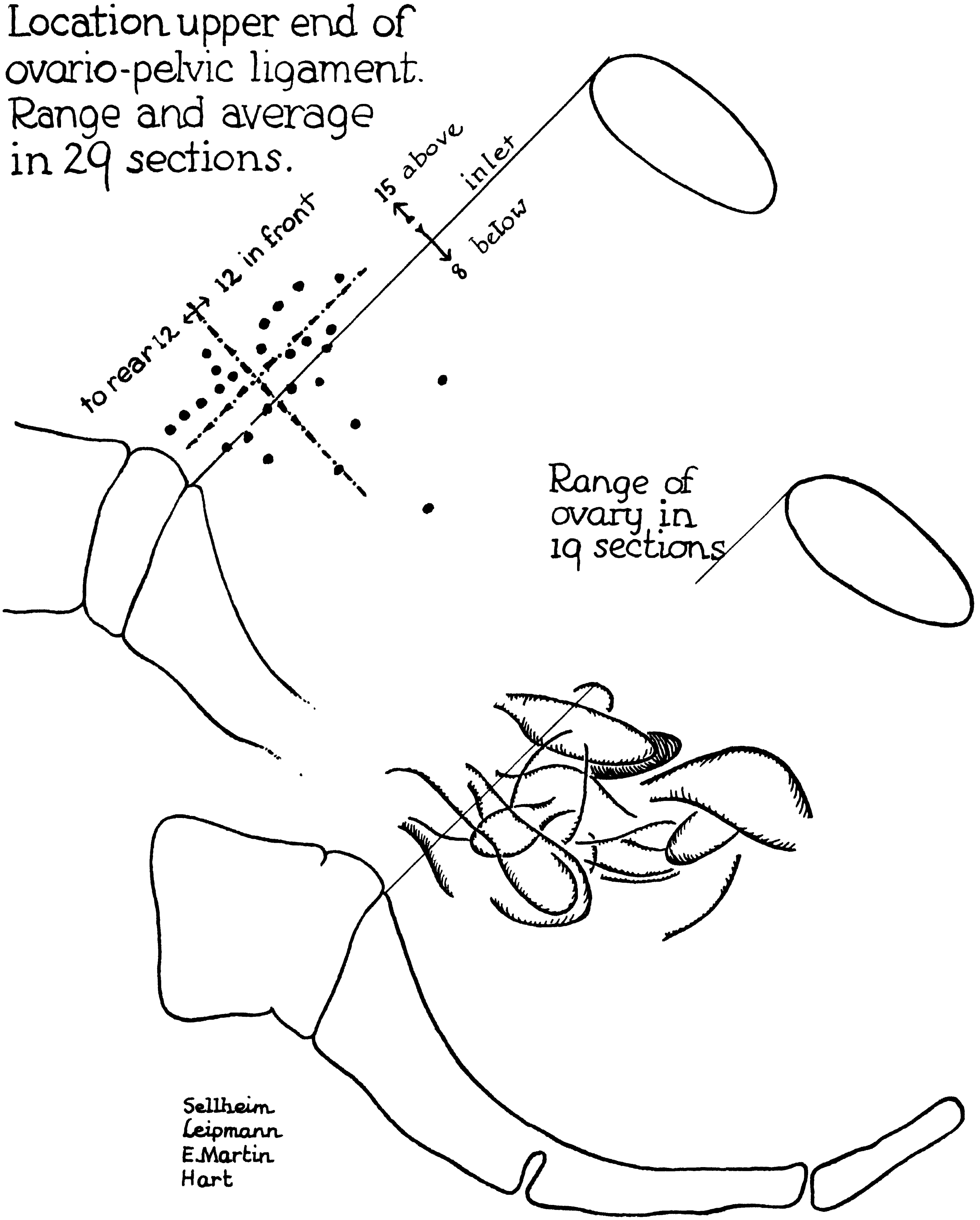
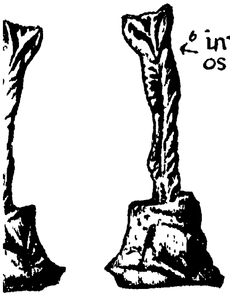

Location upper end of ovario-pelvic ligament. Range and average in 29 sections.
15 above
inlet
8 below
to rear 12
12 in front
Range of ovary in 19 sections
Sellheim
Leipmann
E.Martin
Hart

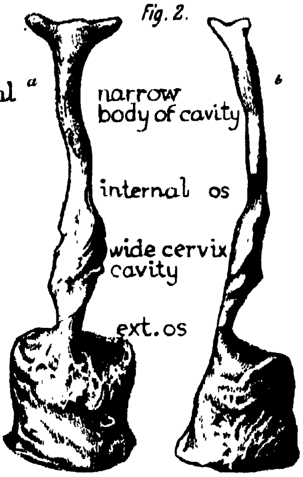
Fig. 27

Fig 1



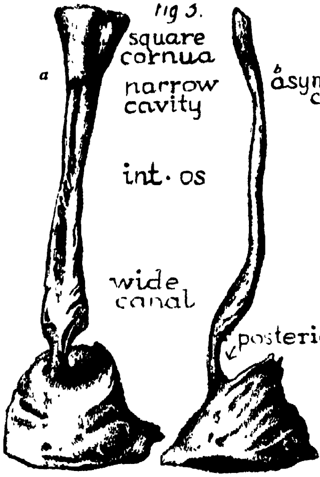
rus of newborn, from
it, showing palmae
atae of cervix
towards fundus

Fig. 2



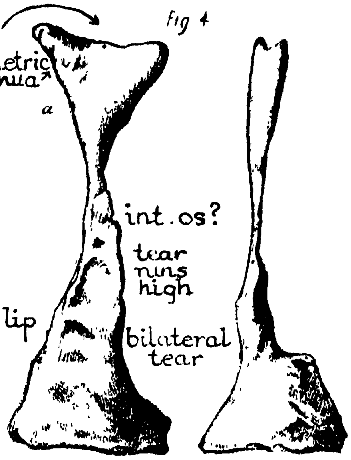
Nullipara, front + side

Fig 3.



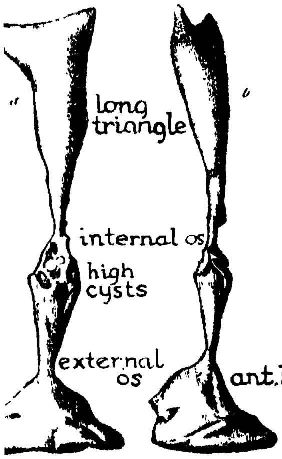
Nullipara, long

Fig 4



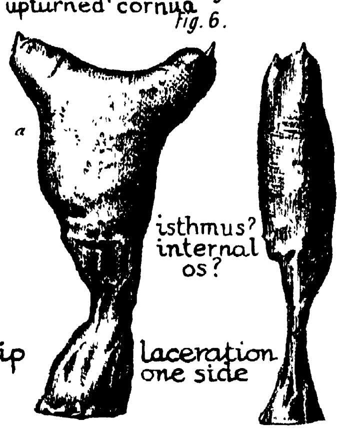
Parous uterus, triangular cavity

Fig 5.



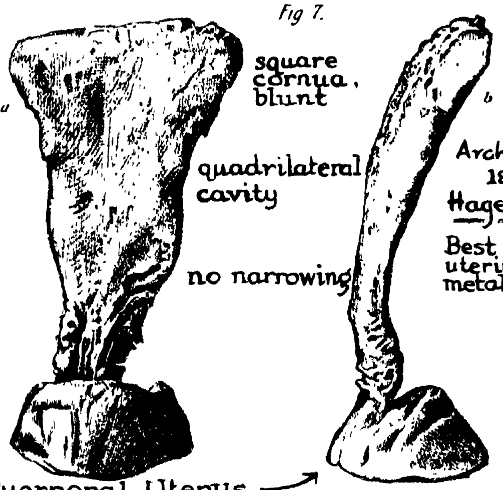
ld virgin

Fig. 6.

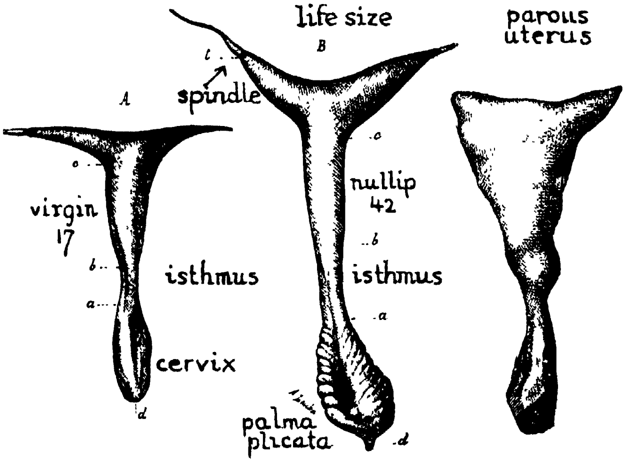


Old multipara

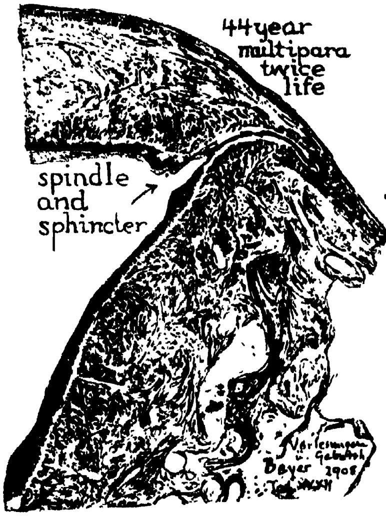
Fig 7.



Puerperal Uterus →

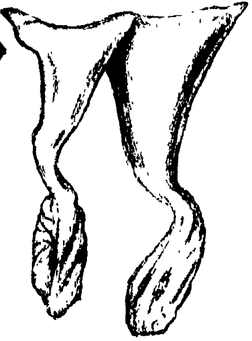


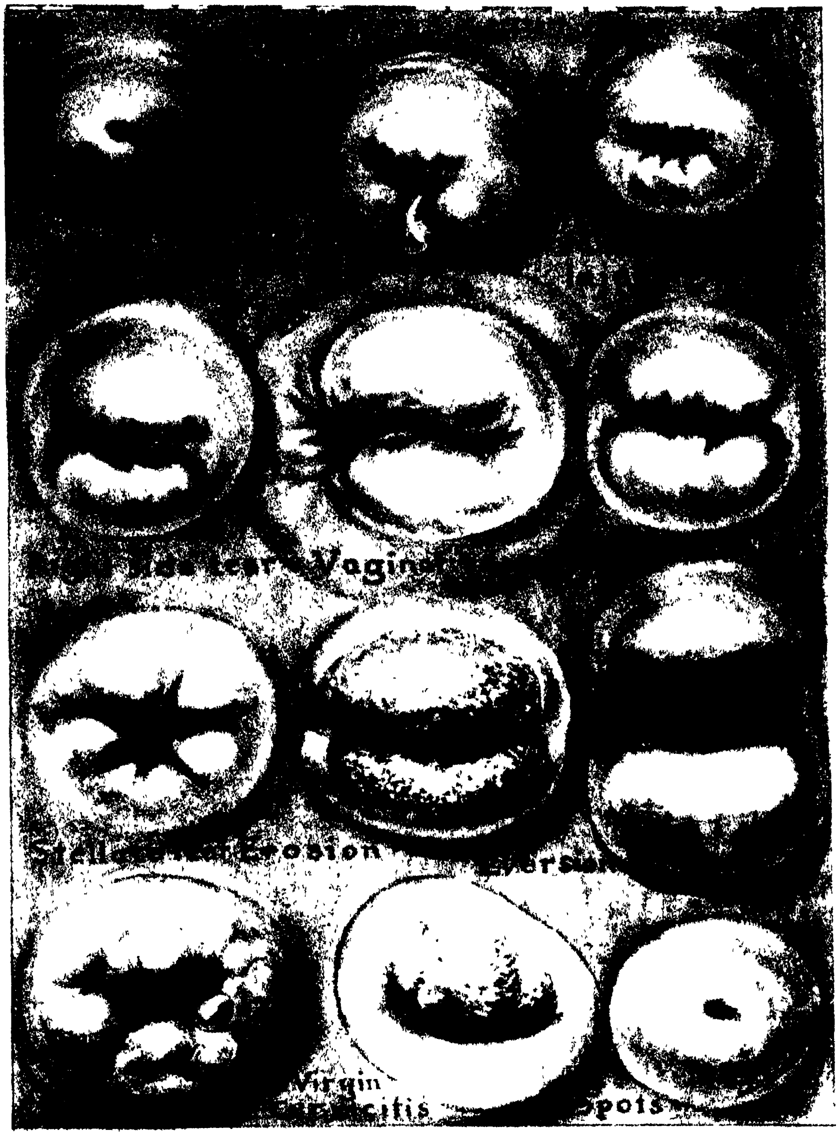
Jhese de Paris 1858
Guyon
Fig. 28



44 year multipara twice life
spindle and sphincter
Verlemungen u. Geburt Beyer 1908

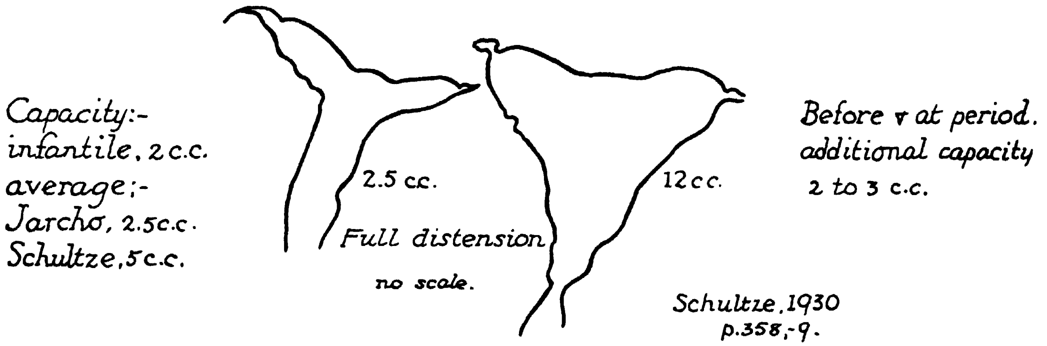
Thirteen Casts of the Cavity of the Uterus



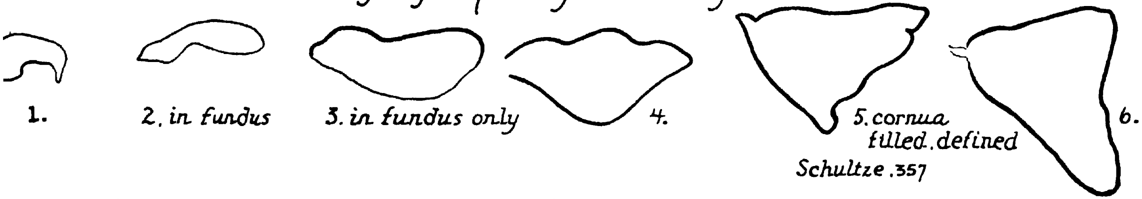


The Cervix, life size

Fig. 29

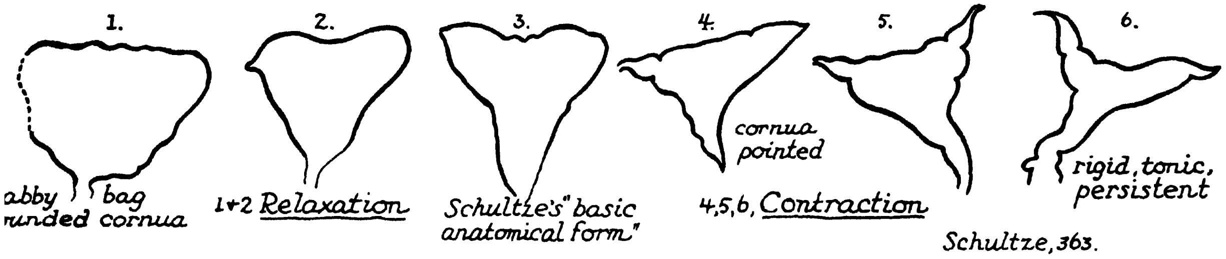


Varying capacity of cavity

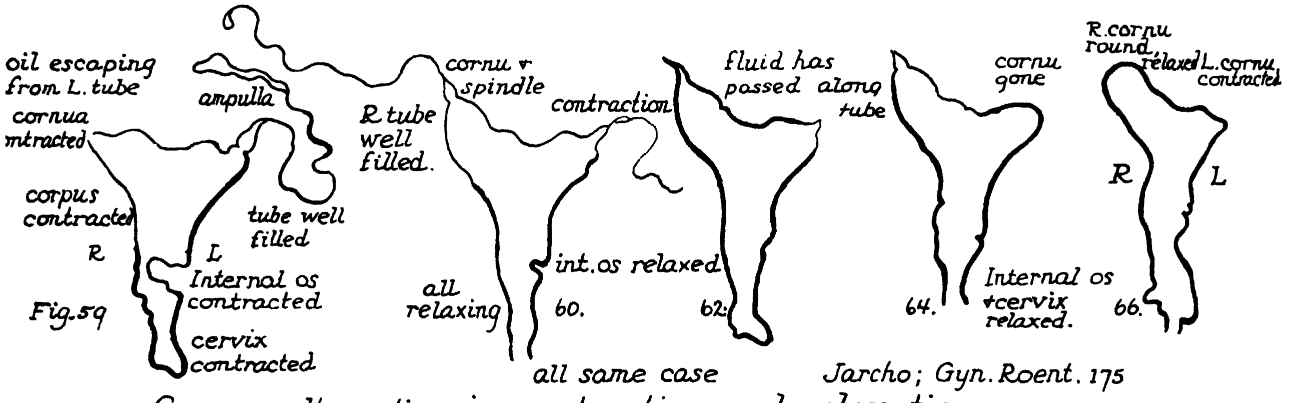


Stages of filling of cavity with opaque fluid.

average diameter, on shadow, cornu to cornu, 3.5 to 7.5
fundus to cervix 4. to 5 (Jarcho, G.R., 162)



Range of muscular activity in uterine walls

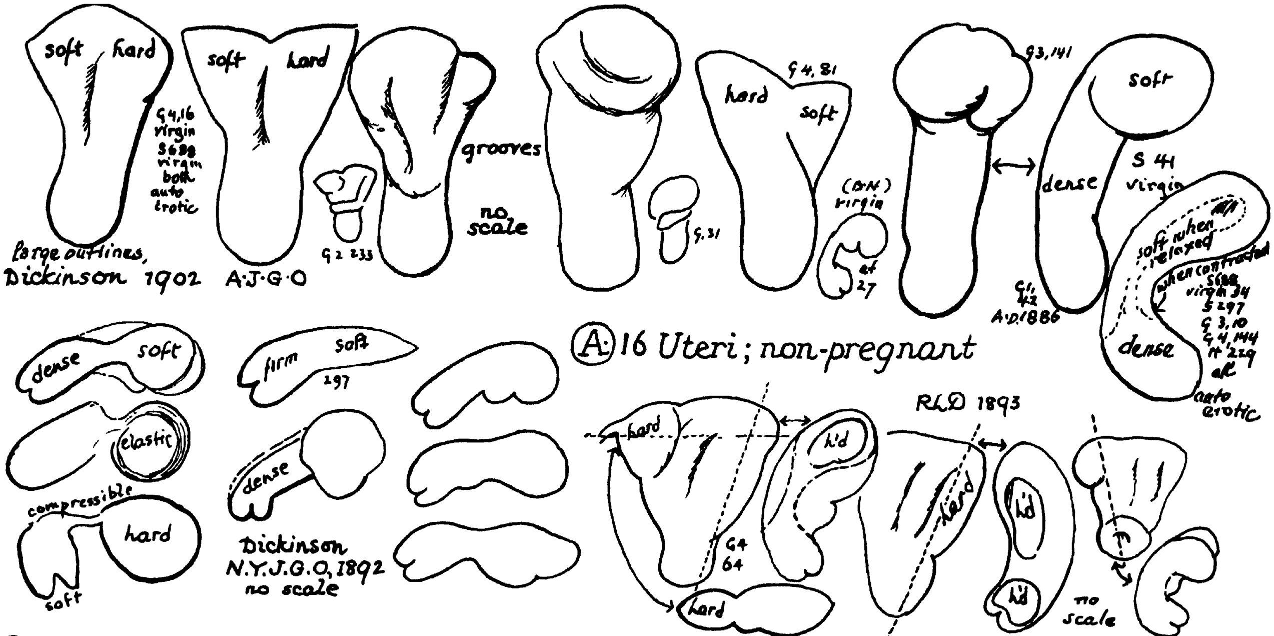


Cornua alternating in contraction and relaxation

Thin outline shows faintness of shadow

Fig. 30

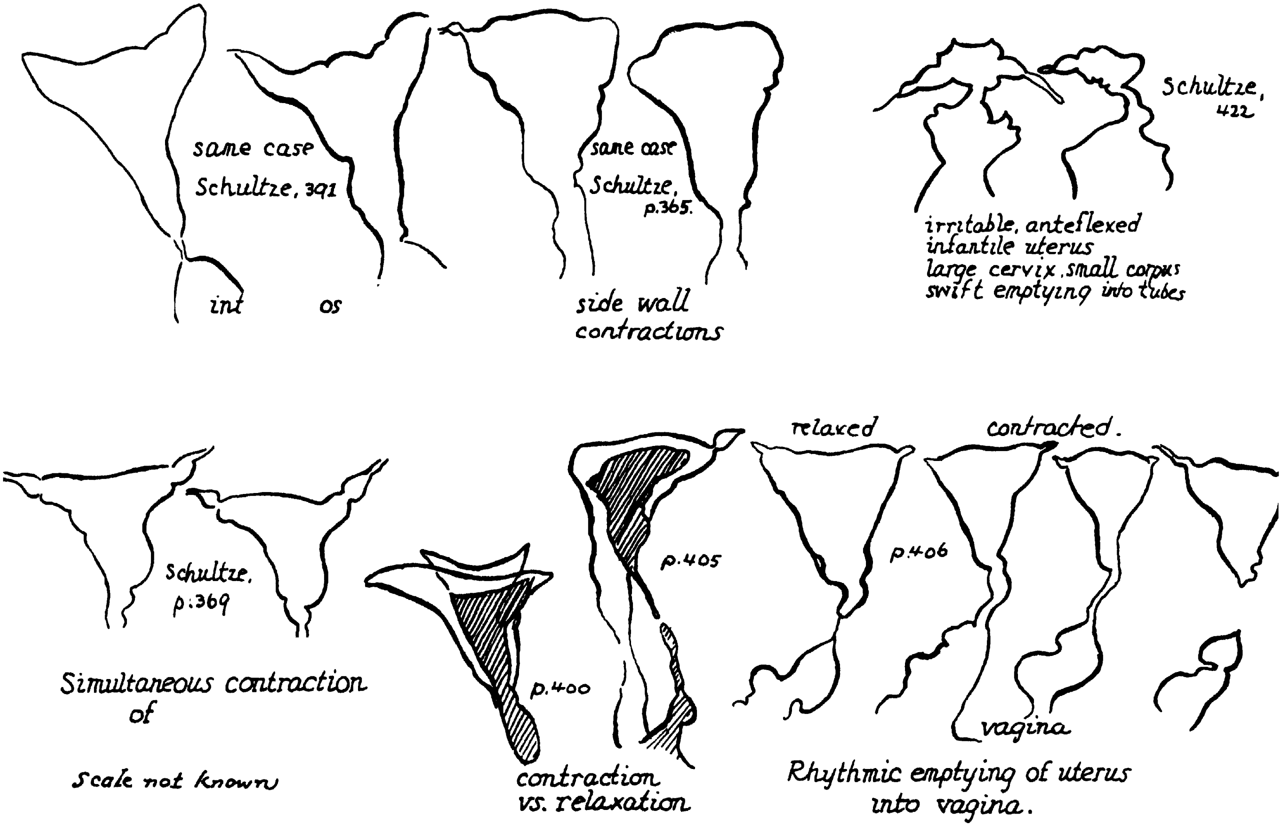
Shape of cavity as affected by



Ⓐ 16 Uteri; non-pregnant

Ⓑ Early pregnancy; vacillations and localized changes in density

Contractions of walls of uterus on bimanual palpation A and B.



varying muscular activity

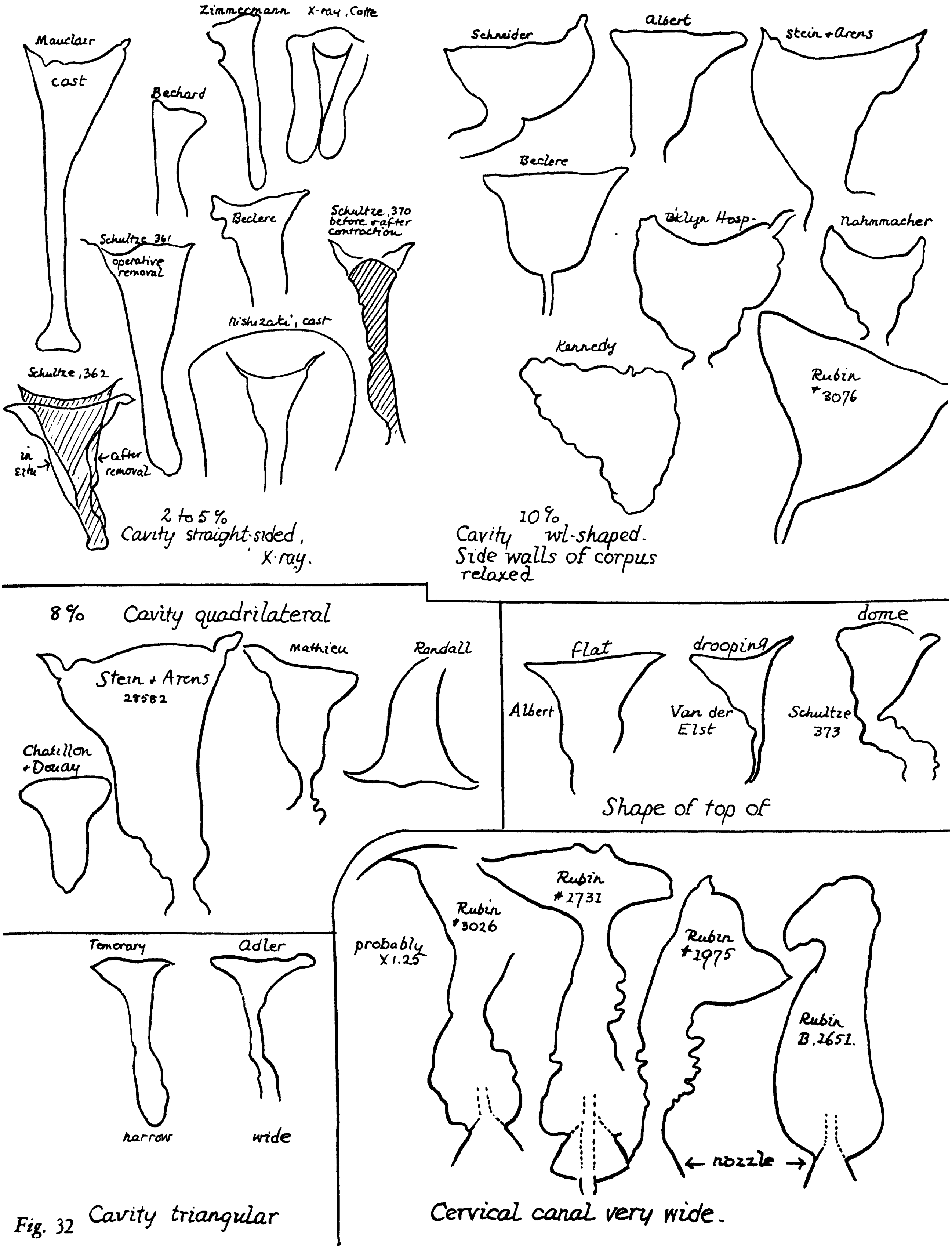
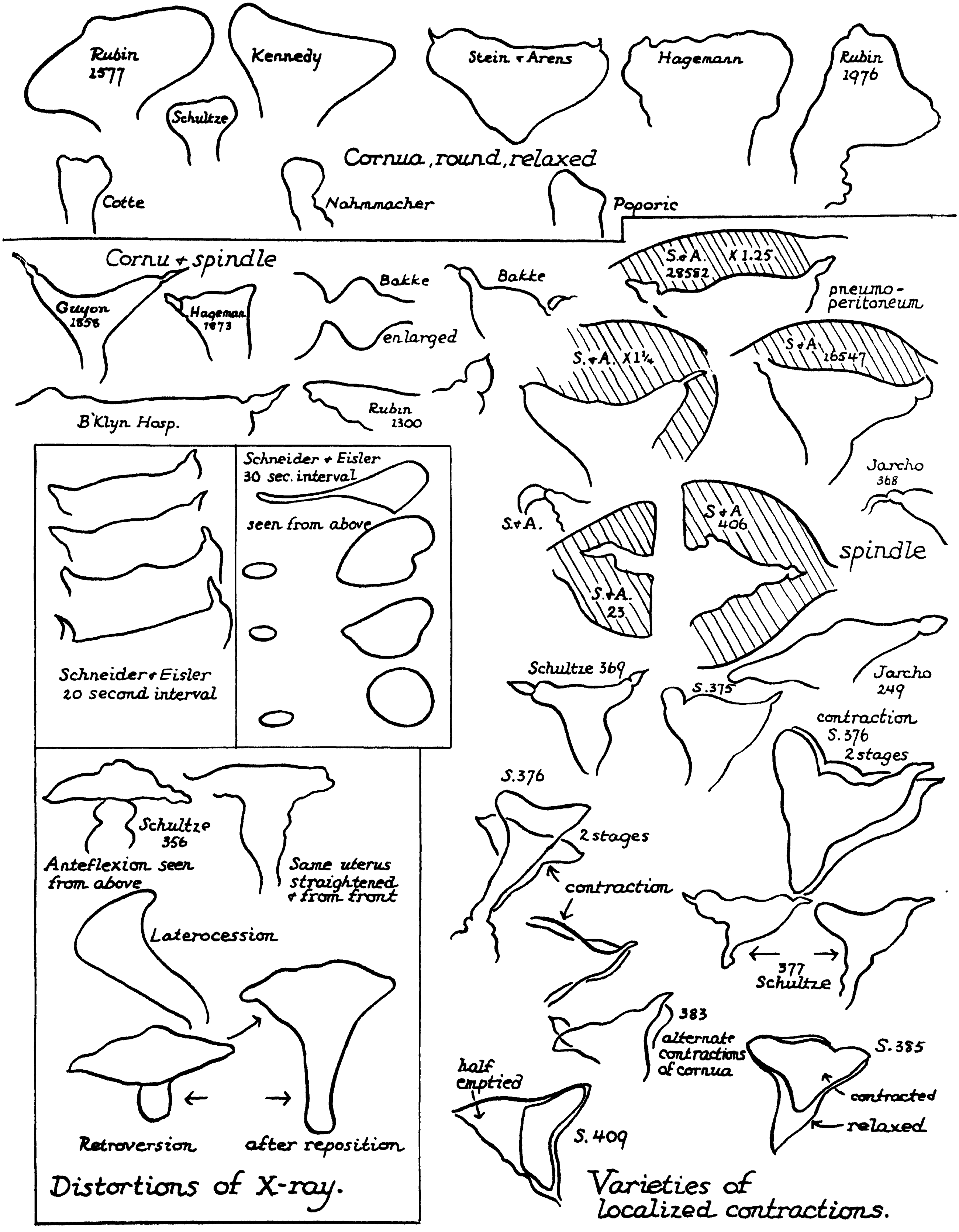

Mauclair
cast
Zimmermann
X-ray, Cotte
Bechard
Beclere
Schultze 361
operative removal
Schultze, 370 before + after contraction
Nishizaki, cast
Schultze, 362
in situ
after removal
2 to 5%
Cavity straight-sided, X-ray.
Schneider
albert
stein + Arens
Beclere
Bklyn Hosp.
Nahmmacher
Kennedy
Rubin #3076
10%
Cavity wl-shaped.
Side walls of corpus relaxed
8%
Cavity quadrilateral
Stein + Arens 28582
Mathieu
Randall
Chatillon + Douay
flat
drooping
dome
Albert
Van der Elst
Schultze 373
Shape of top of
Tenorary
adler
narrow
wide
Cavity triangular
probably X1.25
Rubin #3026
Rubin #1731
Rubin #1975
Rubin B.2651.
nozzle
Cervical canal very wide.

Fig. 32


Rubin 1577
Kennedy
Schultze
Stein & Arens
Hagemann
Rubin 1976
Cornua, round, relaxed
Cotte
Nahmmacher
Poporic
Cornu & spindle
Guyon 1858
Hageman 1873
Bakke
enlarged
Bakke
S.&A. X1.25 28582
pneumo-peritoneum
B'Klyn Hosp.
Rubin 1300
S.&A. X1¼
S&A 16547
Schneider & Eisler 30 sec. interval
seen from above
Schneider & Eisler 20 second interval
Jarcho 368
S.&A.
S&A 406
spindle
S.&A. 23
Schultze 369
S.375
Jarcho 249
contraction S.376 2 stages
Schultze 356
Anteflexion seen from above
Same uterus straightened & from front
Laterocession
S.376
2 stages
contraction
377 Schultze
383
alternate contractions of cornua
S.385
contracted
relaxed
half emptied
S.409
Retroversion
after reposition
Distortions of X-ray.
Varieties of localized contractions.

ig. 33

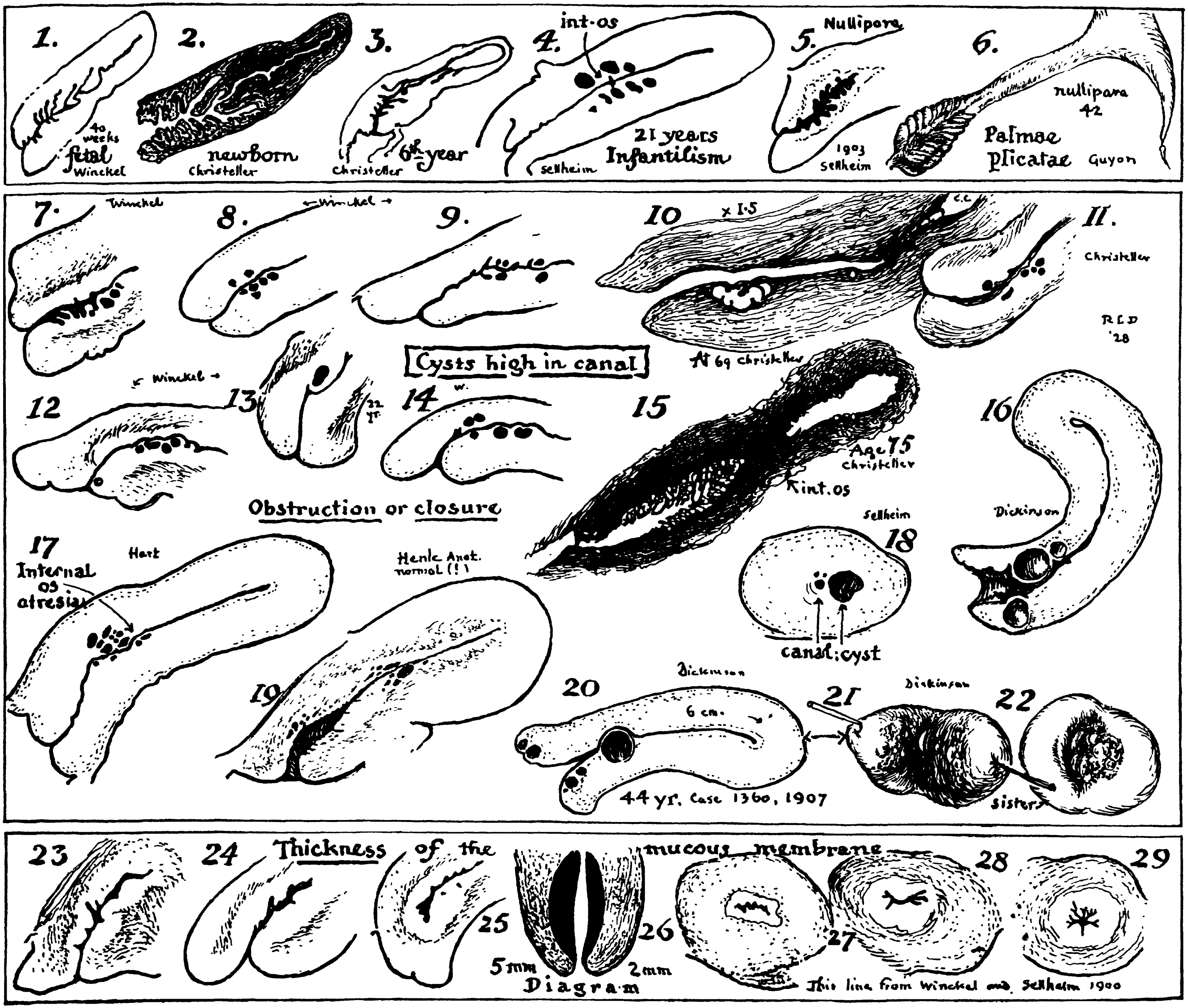
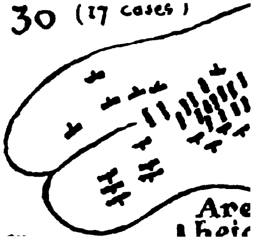
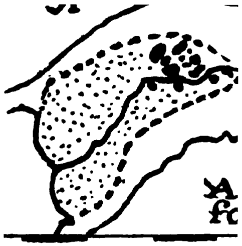
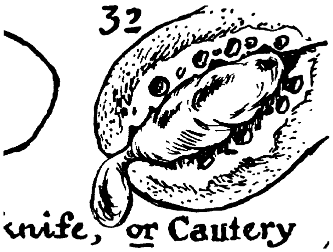
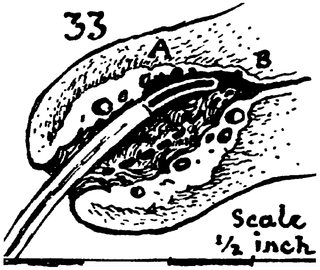

1.
40 weeks
fetal
Winckel
2.
newborn
Christeller
3.
6th year
Christeller
4.
int·os
21 years
Infantilism
Sellheim
5.
Nullipara
1903
Sellheim
6.
nullipara
42
Palmae
plicatae
Guyon
7.
Winckel
8.
← Winckel →
9.
10
x 1·5
c.c.
11.
Christeller
RLD
'28
Cysts high in canal
At 69 Christeller
12
← Winckel →
13
22 yr
14
W.
15
Age 75
Christeller
int. os
16
Dickinson
Obstruction or closure
Sellheim
18
canal; cyst
17
Hart
Internal os atresia
Henle Anat.
normal (!)
19
Dickinson
20
6 cm.
44 yr. Case 1360, 1907
21
Dickinson
22
sisters
23
24
Thickness of the mucous membrane
25
26
5 mm
2 mm
Diagram
27
28
29
This line from Winckel and Sellheim 1900

Fig. 34

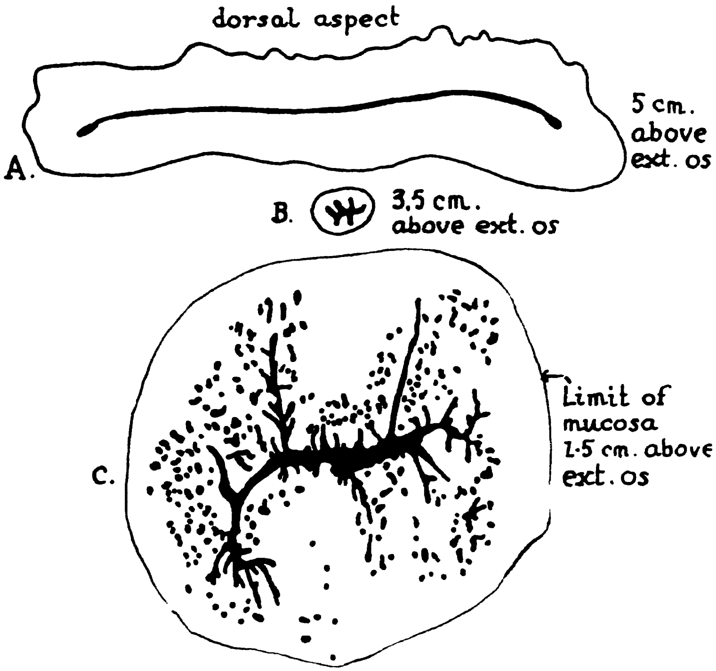








Cervical Mucosa, thickness & cysts.



Comparison of thickness of mucous membrane of body A, isthmus B., and cervix C, in cross-section. in nullipara. 36. X 3.5 Stieve. Halsteil, p. 21.

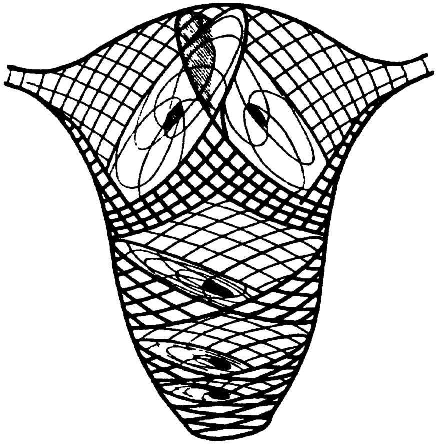


Diagram of deep muscle layers of the uterus after Goerttler

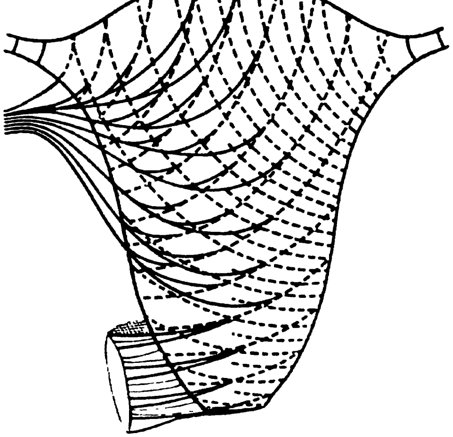
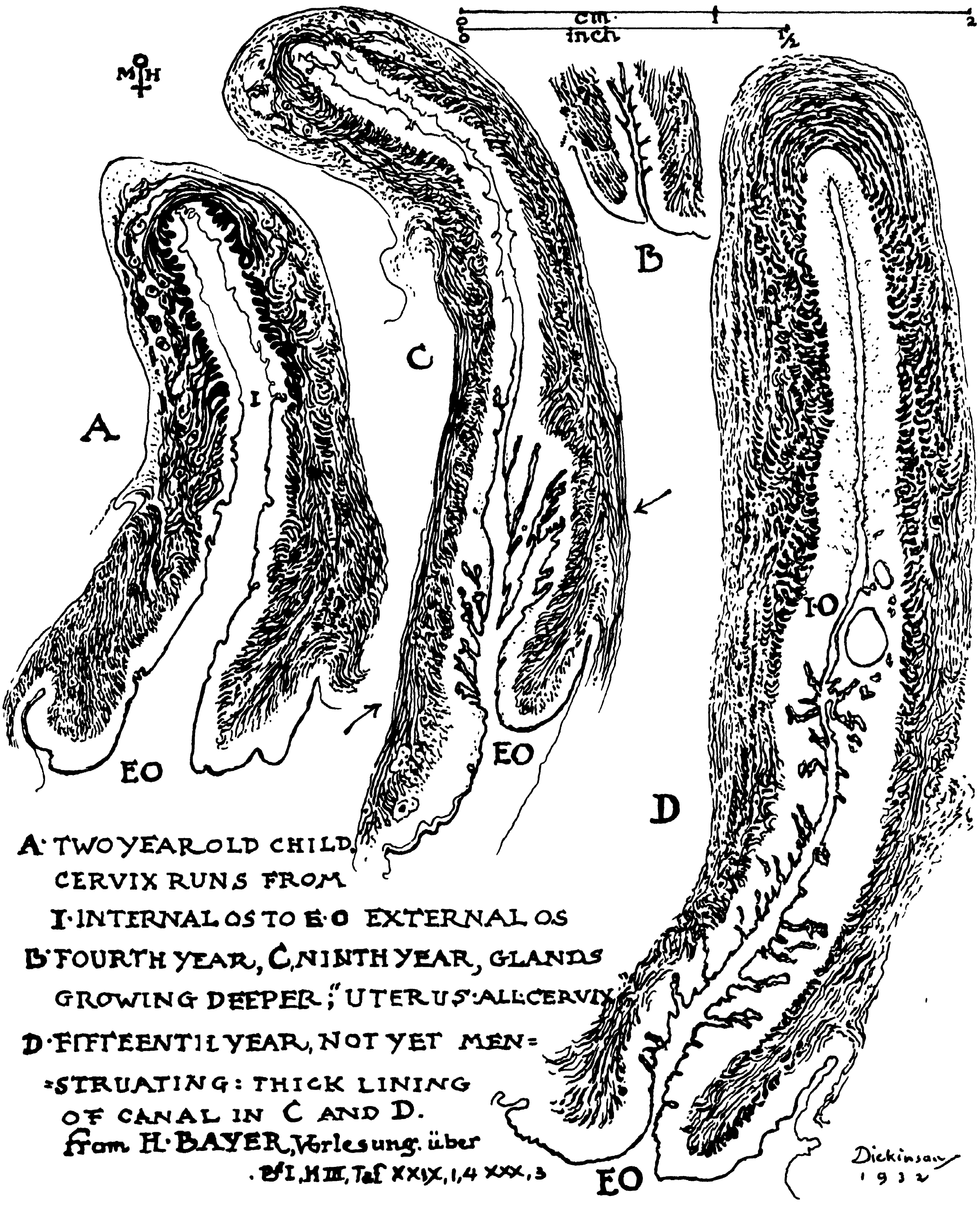


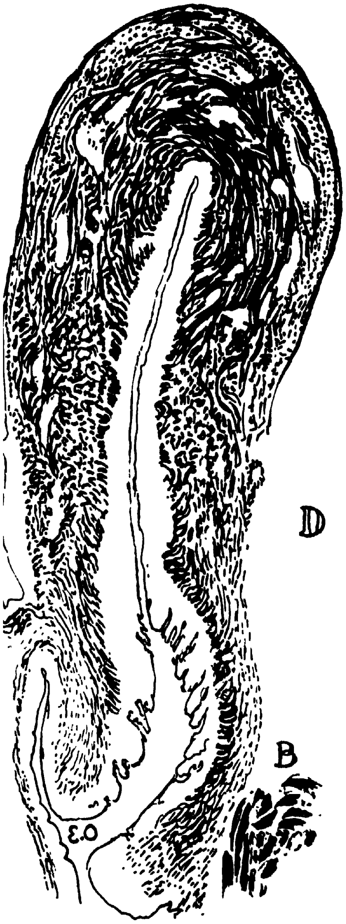
Diagram of superficial muscle layers of uterus after Goerttler

Fig. 35

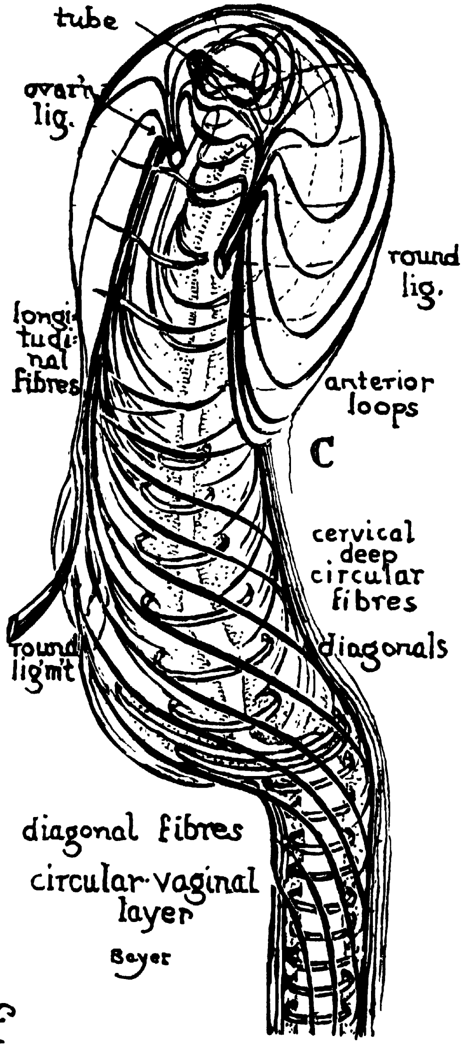

0 cm 1 2
0 inch 1/2
M H
A
I
B
C
D
EO
EO
EO
IO
A· TWO YEAR OLD CHILD. CERVIX RUNS FROM I· INTERNAL OS TO E·O EXTERNAL OS
B· FOURTH YEAR, C, NINTH YEAR, GLANDS GROWING DEEPER; "UTERUS ALL CERVIX"
D· FIFTEENTH YEAR, NOT YET MEN=STRUATING: THICK LINING OF CANAL IN C AND D.
from H· BAYER, Vorlesung. über . Bd I, H III, Taf XXIX, 1,4 XXX, 3
Dickinson 1932

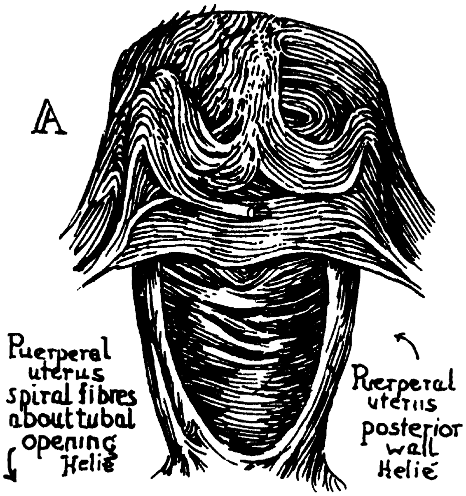
CERVIX OF CHILD: RECESSES IN WHICH INFECTION PERSISTS

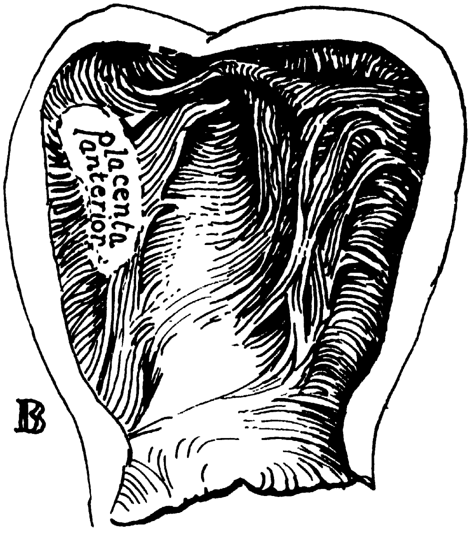
Fig. 36



15 yr. old, menstruating girl, from Bayer




A
Puerperal uterus spiral fibres about tubal opening Helié
Puerperal uterus posterior wall Helié



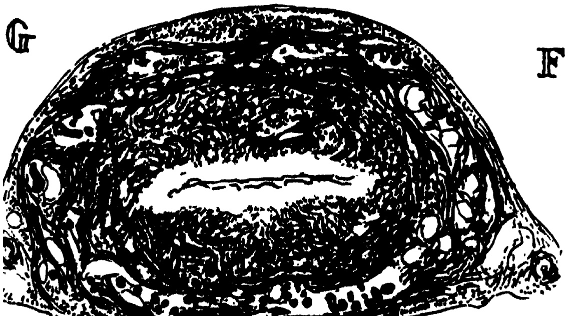
Muscle layers of uterus, also vessel layers

B Bladder : E.O. External os

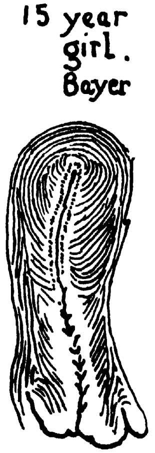
VL Vesical? ligament

Parous woman, simplified from Bayer

Parous woman direction of fibres



F



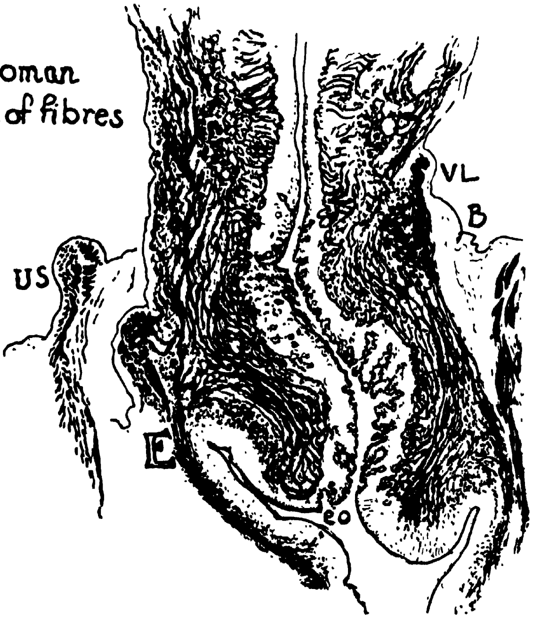
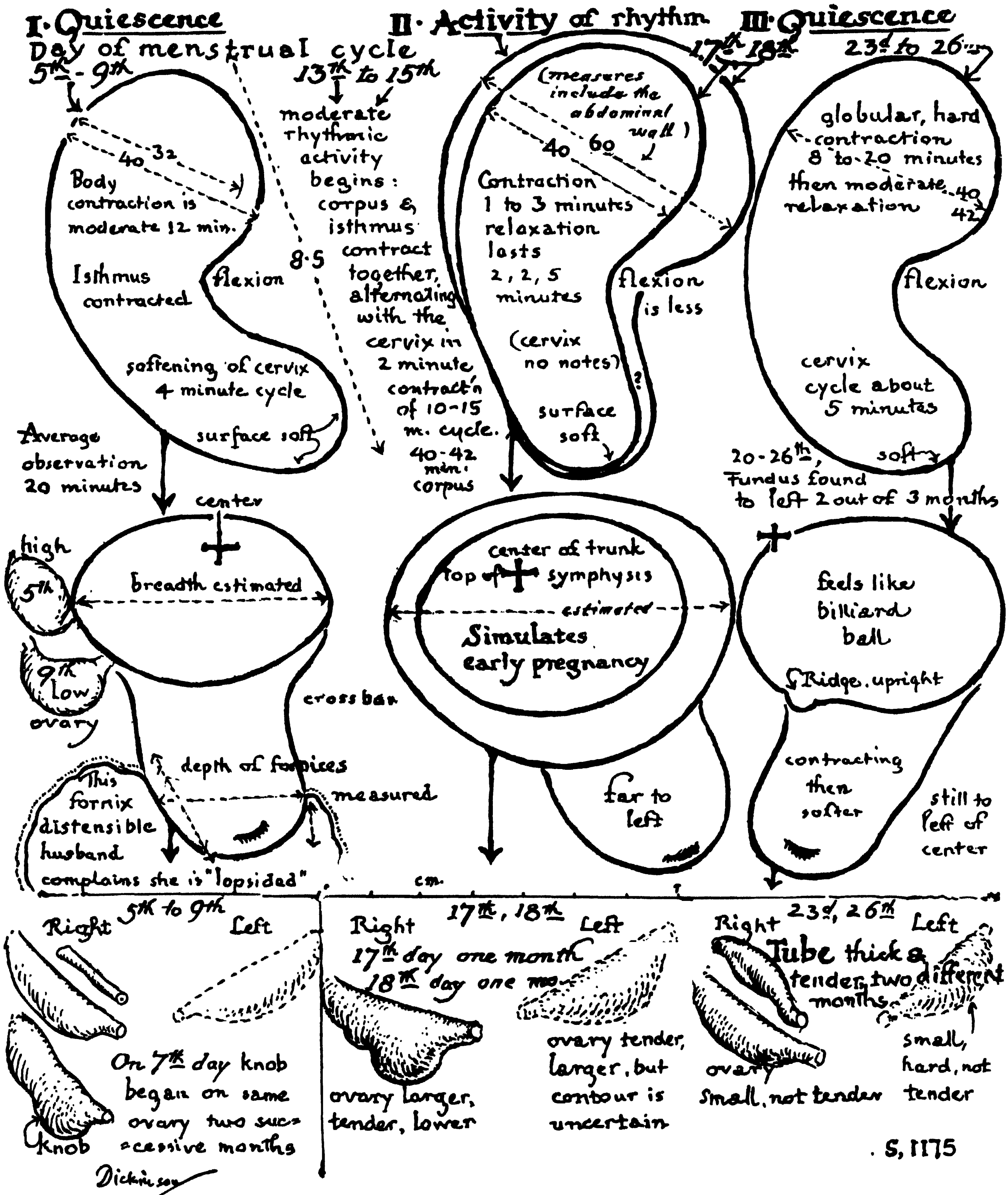


Fig. 37


I · Quiescence
Day of menstrual cycle
5th - 9th
40
32
Body contraction is moderate 12 min.
Isthmus contracted
flexion
softening of cervix 4 minute cycle
surface soft
Average observation 20 minutes
8·5
II · Activity of rhythm
13th to 15th
moderate rhythmic activity begins: corpus & isthmus contract together, alternating with the cervix in 2 minute contract'n of 10-15 m. cycle.
40-42 min. corpus
17th 18th
(measures include the abdominal wall)
40
60
Contraction 1 to 3 minutes relaxation lasts 2, 2, 5 minutes
flexion is less
(cervix no notes)
?
surface soft
III · Quiescence
23d to 26th
globular, hard contraction 8 to 20 minutes then moderate relaxation
40
42
flexion
cervix cycle about 5 minutes
soft
20-26th, Fundus found to left 2 out of 3 months
center
high
5th
9th
low
ovary
breadth estimated
cross bar
depth of fornices
measured
This fornix distensible husband complains she is "lopsided"
center of trunk
top of symphysis
estimated
Simulates early pregnancy
far to left
feels like billiard ball
Ridge, upright
contracting then softer
still to left of center
cm.
5th to 9th
Right
Left
On 7th day knob began on same ovary two successive months
knob
17th, 18th
Right
Left
17th day one month
18th day one mo.
ovary larger, tender, lower
ovary tender, larger, but contour is uncertain
23d, 26th
Right
Left
Tube thick & tender two different months
ovary
Small, not tender
small, hard, not tender
S, 1175
Dickinson

Case : Monthly cycle of quiescence, activity, quiescence, for uterus, ovary and tube.

Fig. 38

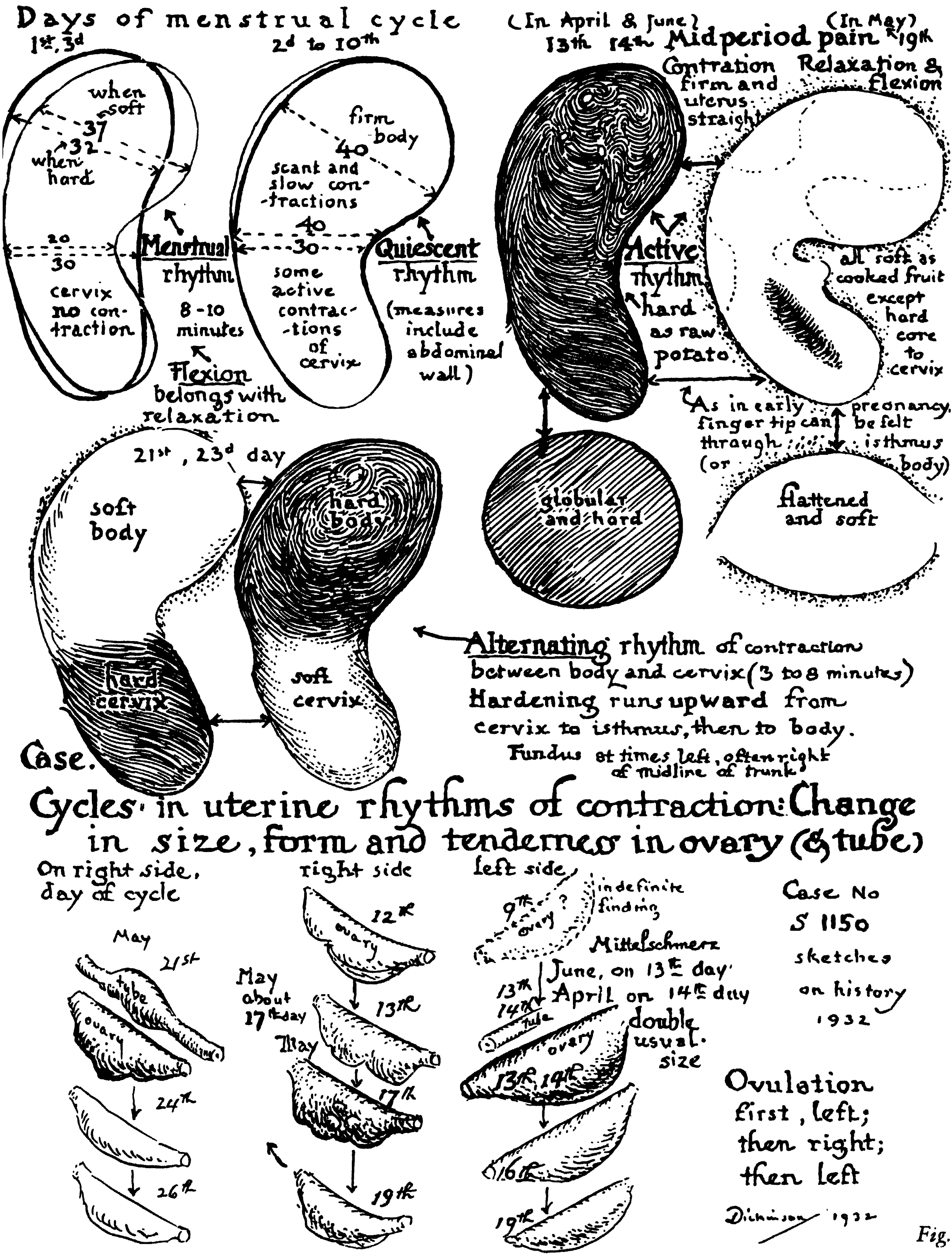
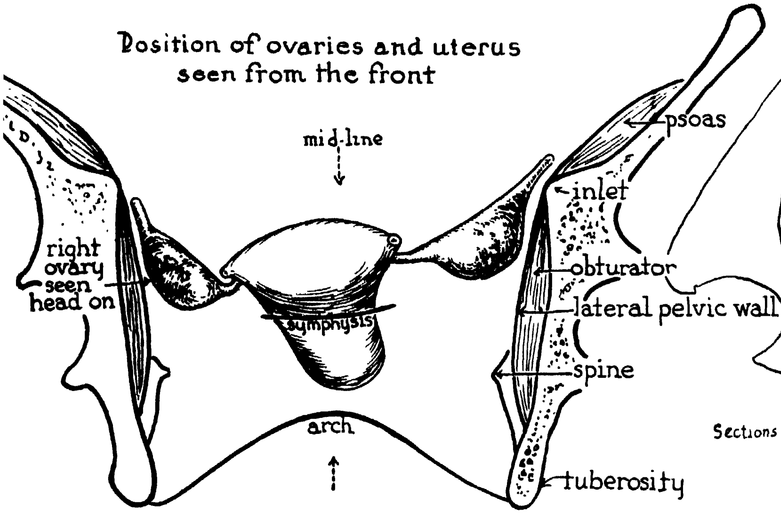
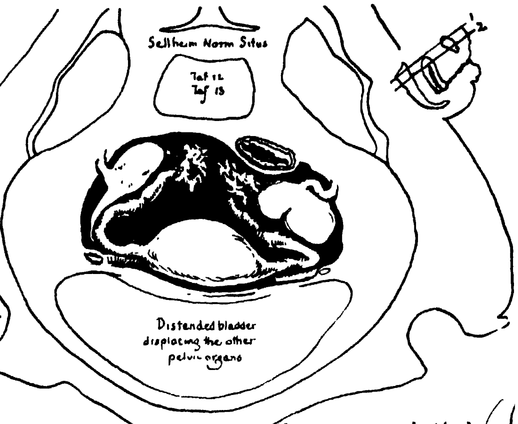

Days of menstrual cycle
1st, 3d
when soft
37
32
when hard
20
30
cervix no contraction
Menstrual rhythm
8-10 minutes
Flexion belongs with relaxation
2d to 10th
firm body
40
scant and slow contractions
40
30
some active contractions of cervix
Quiescent rhythm
(measures include abdominal wall)
(In April & June)
13th 14th Midperiod pain
(In May)
19th
Contration firm and uterus straight
Relaxation & flexion
Active rhythm
hard as raw potato
all soft as cooked fruit except hard core to cervix
As in early pregnancy finger tip can be felt through isthmus (or body)
globular and hard
flattened and soft
21st, 23d day
soft body
hard body
hard cervix
soft cervix
Alternating rhythm of contraction between body and cervix (3 to 8 minutes)
Hardening runs upward from cervix to isthmus, then to body.
Fundus at times left, often right of midline of trunk
Case.
Cycles in uterine rhythms of contraction: Change in size, form and tenderness in ovary (& tube)
On right side, day of cycle
May
21st
tube
ovary
24th
26th
right side
12th
ovary
May about 17th day
13th
May
17th
19th
left side
9th
ovary
?
indefinite finding
Mittelschmerz
June, on 13th day
April on 14th day
13th
14th
tube
ovary
double usual size
13th, 14th
16th
19th
Case No S 1150 sketches on history 1932
Ovulation first, left; then right; then left
Dickinson 1932

Fig. 39

Position of ovaries and uterus seen from the front

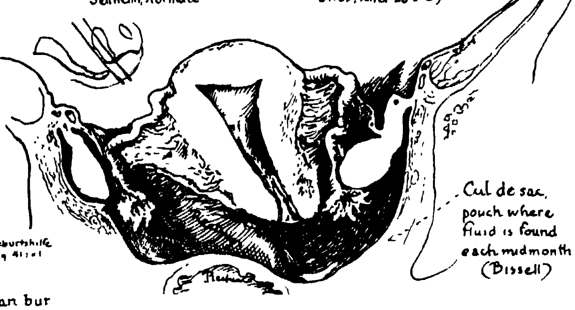




Sections in plane of inlet

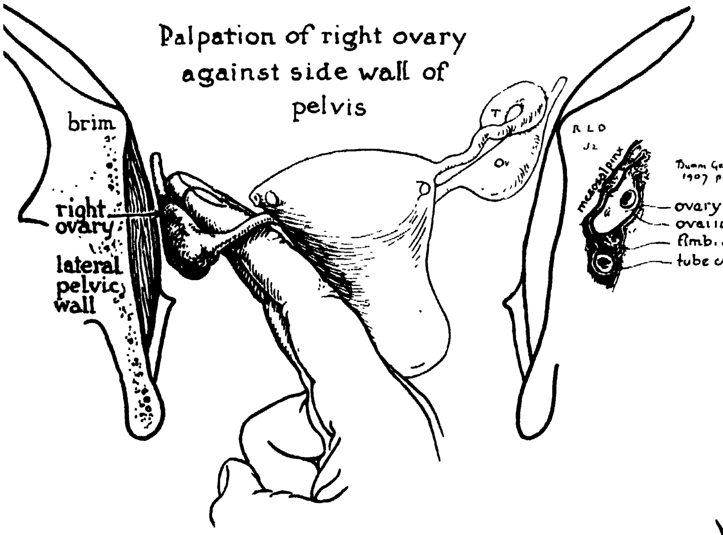
Uterus, ovaries pushed back

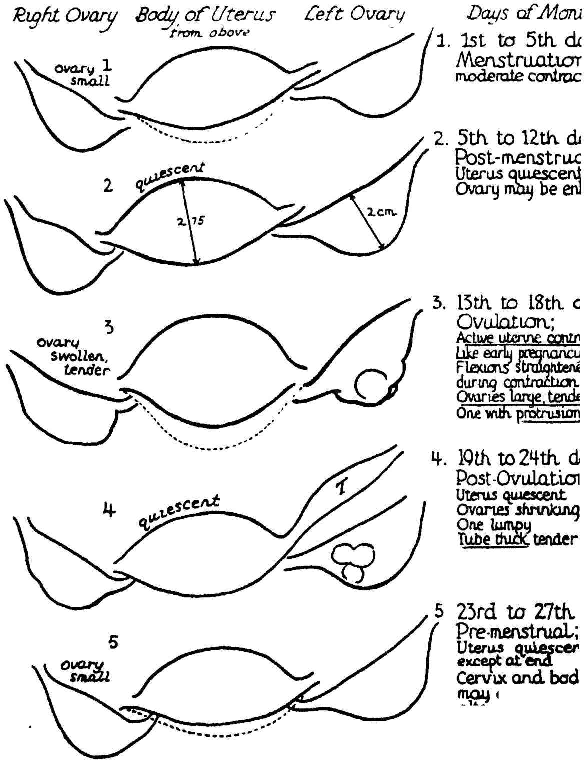
Sellheim, Normale Situs, Tafel 28 u 29


Cul de sac, pouch where fluid is found each midmonth (Bissell)
Rectum

Section near axis of pelvic inlet ovaries and pelvi

Palpation of right ovary against side wall of pelvis





Utero-ovarian monthly cycle in diagrams

Bimanual palpation of left ovary with uterus pushed to right

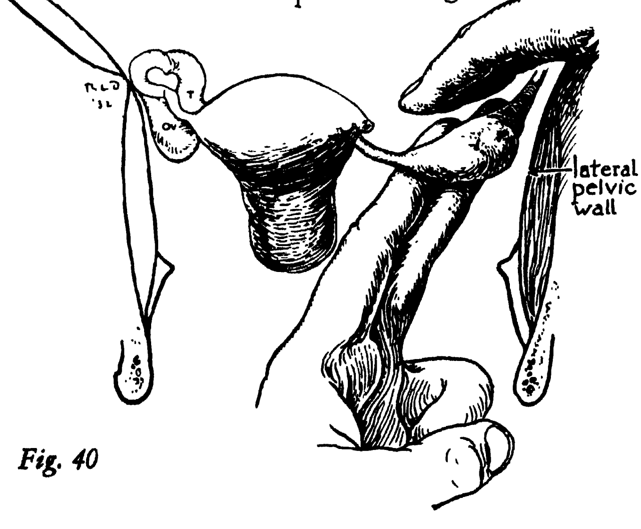


Fig. 40

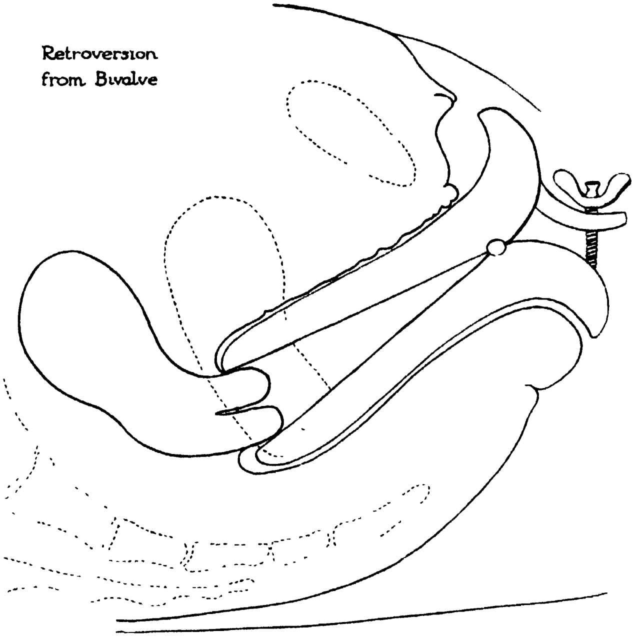


Fig. 41a

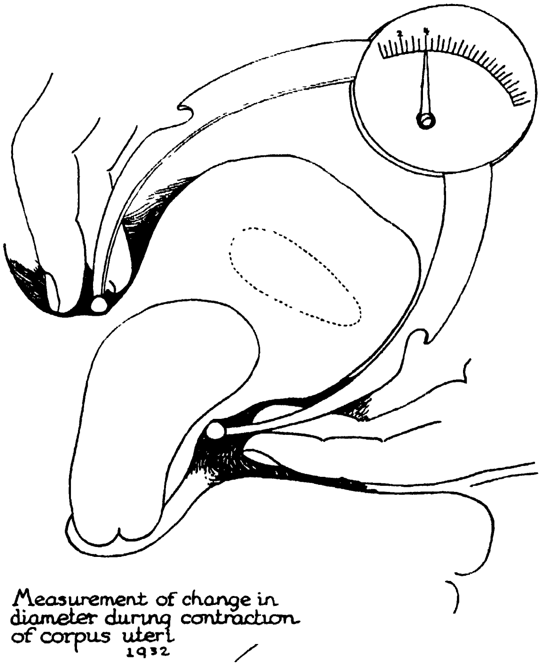
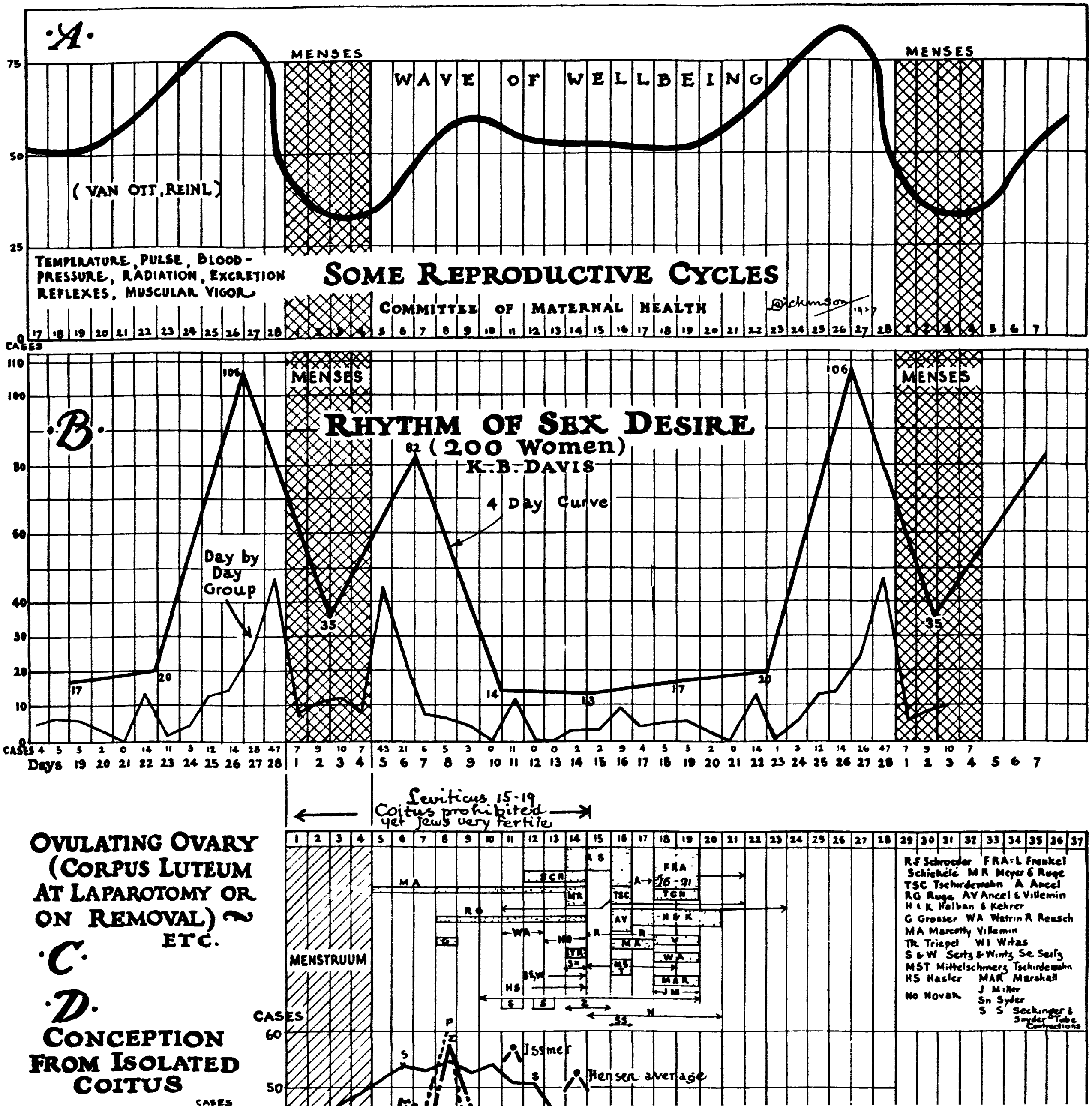


Fig. 41b



SOME REPRODUCTIVE CYCLES

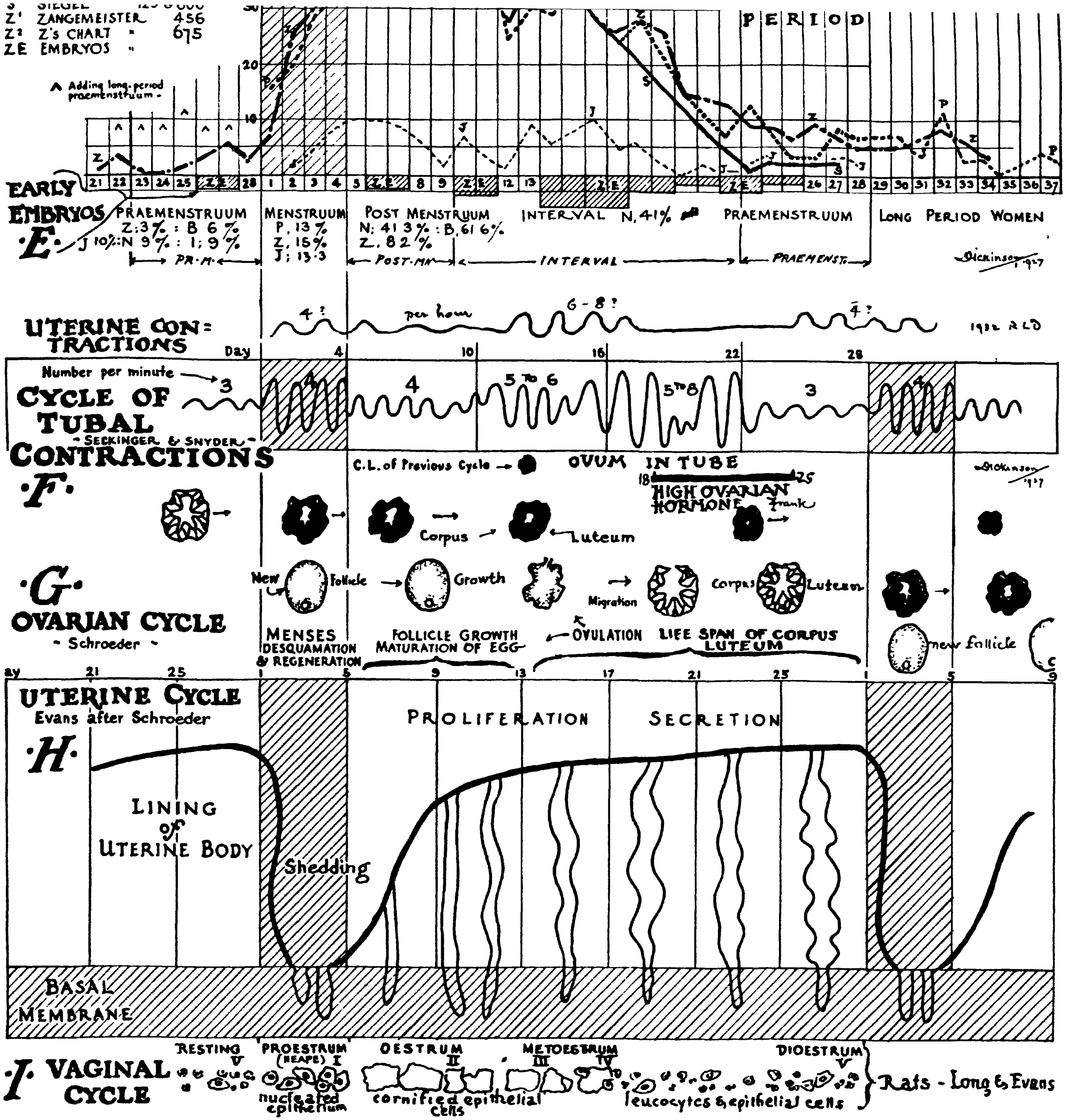
COMMITTEE OF MATERNAL HEALTH

·A· WAVE OF WELLBEING (VAN OTT, REINL)

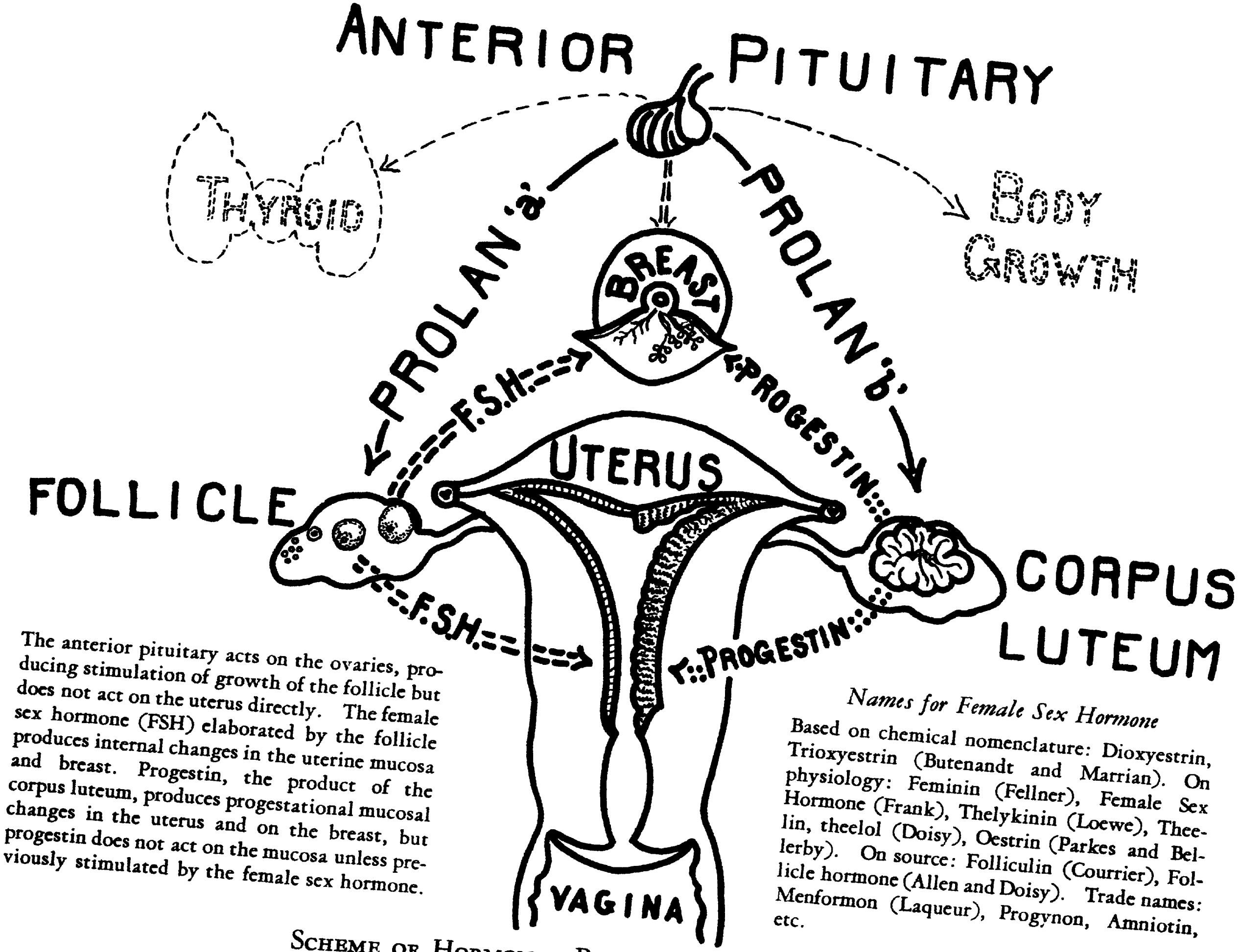
·B· RHYTHM OF SEX DESIRE (200 Women) K. B. DAVIS

OVULATING OVARY (CORPUS LUTEUM AT LAPAROTOMY OR ON REMOVAL) ~ ETC. ·C·

·D· CONCEPTION FROM ISOLATED COITUS



RHYTHMS OF THE REPRODUCTIVE LIFE



The anterior pituitary acts on the ovaries, producing stimulation of growth of the follicle but does not act on the uterus directly. The female sex hormone (FSH) elaborated by the follicle produces internal changes in the uterine mucosa and breast. Progestin, the product of the corpus luteum, produces progestational mucosal changes in the uterus and on the breast, but progestin does not act on the mucosa unless previously stimulated by the female sex hormone.

Names for Female Sex Hormone

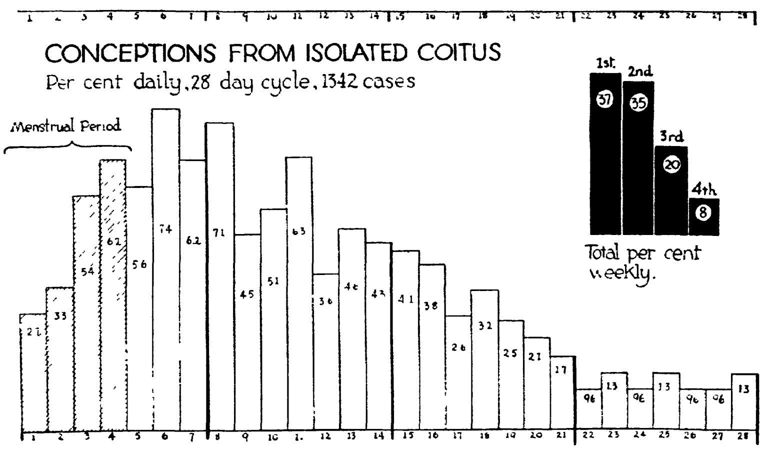
Based on chemical nomenclature: Dioxyestrin, Trioxyestrin (Butenandt and Marrian). On physiology: Feminin (Fellner), Female Sex Hormone (Frank), Thelykinin (Loewe), Theelin, theelol (Doisy), Oestrin (Parkes and Bellerby). On source: Folliculin (Courrier), Follicle hormone (Allen and Doisy). Trade names: Menformon (Laqueur), Progynon, Amniotin, etc.

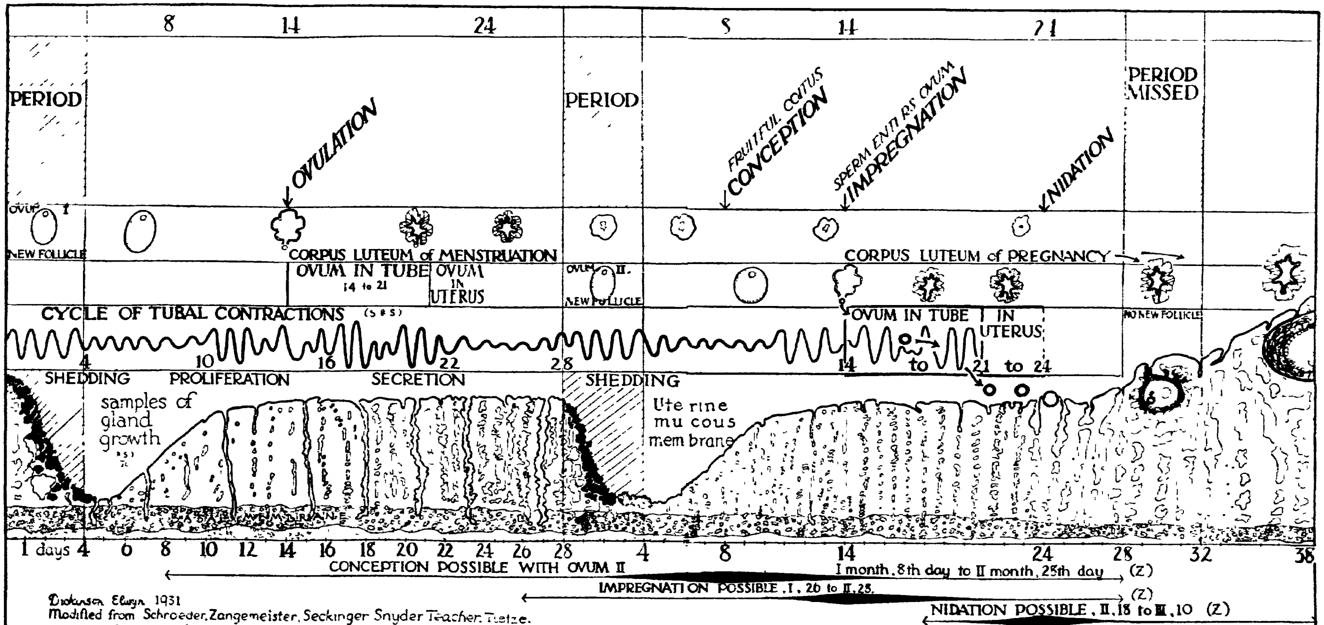
SCHEME OF HORMONAL BASIS OF HUMAN SEX CYCLE

BY ROBERT TILDEN FRANK

CONCEPTIONS FROM ISOLATED COITUS

Per cent daily, 28 day cycle, 1342 cases

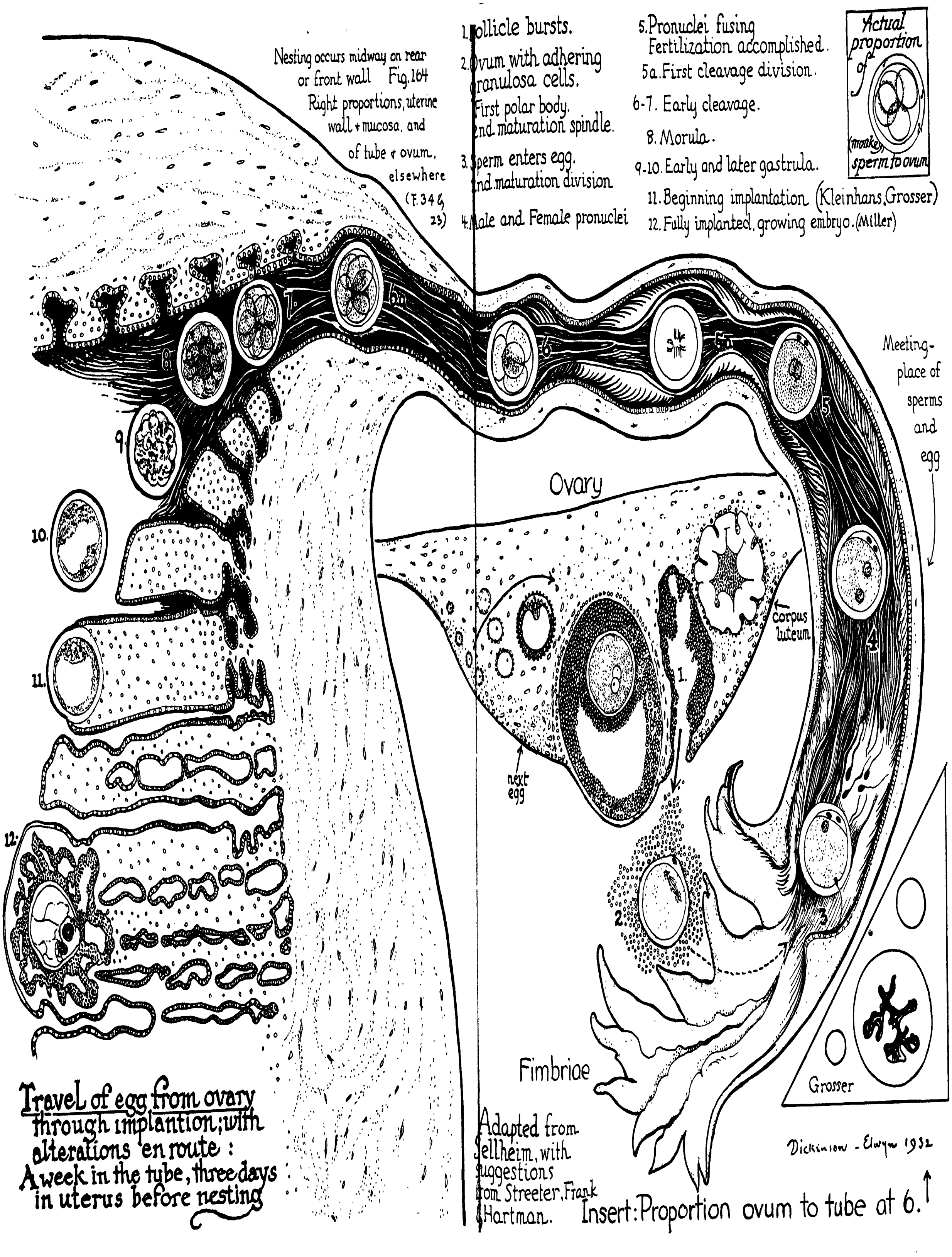




Dickinson Eltyn 1931
Modified from Schroeder, Zangemeister, Seckinger Snyder Teacher Tietze.

OVULATION, MENSTRUATION, IMPREGNATION, DIAGRAMMATICALLY SHOWN

ig. 44



1. ollicle bursts.
2. Ovum with adhering
ranulosa cells.
First polar body.
nd. maturation spindle.
3. perm enters egg.
nd. maturation division
4. ale and Female pronuclei
5. Pronuclei fusing
Fertilization accomplished.
5a. First cleavage division.
6-7. Early cleavage.
8. Morula.
9-10. Early and later gastrula.
11. Beginning implantation (Kleinhans, Grosser)
12. Fully implanted, growing embryo. (Miller)
Actual proportion of (monkey) sperm to ovum
Nesting occurs midway on rear or front wall Fig. 164
Right proportions, uterine wall + mucosa, and of tube + ovum, elsewhere (F. 34 & 23)
Meeting-place of sperms and egg
Ovary
corpus luteum
next egg
Fimbriae
Grosser
1.
2.
3
4
5
5a
6
6a
7.
8
9
10.
11.
12.
Adapted from Sellheim, with suggestions from Streeter, Frank Hartman.
Insert: Proportion ovum to tube at 6.
Dickinson - Elwyn 1932

Travel of egg from ovary through implantion; with alterations en route: A week in the tube, three days in uterus before nesting

Fig. 45

Fig. 46a

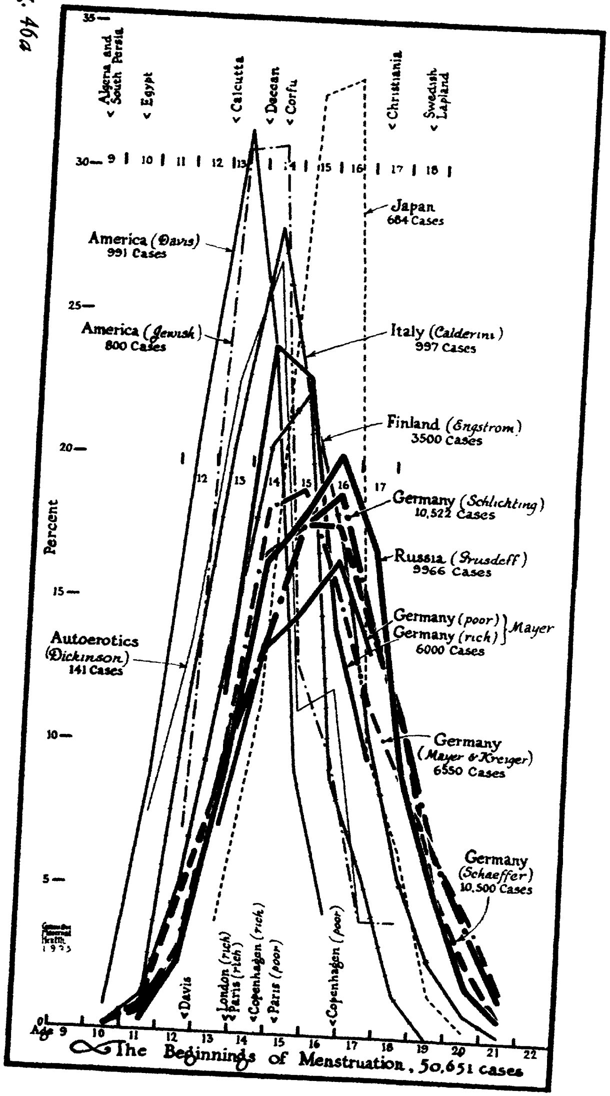


Fig. 46b

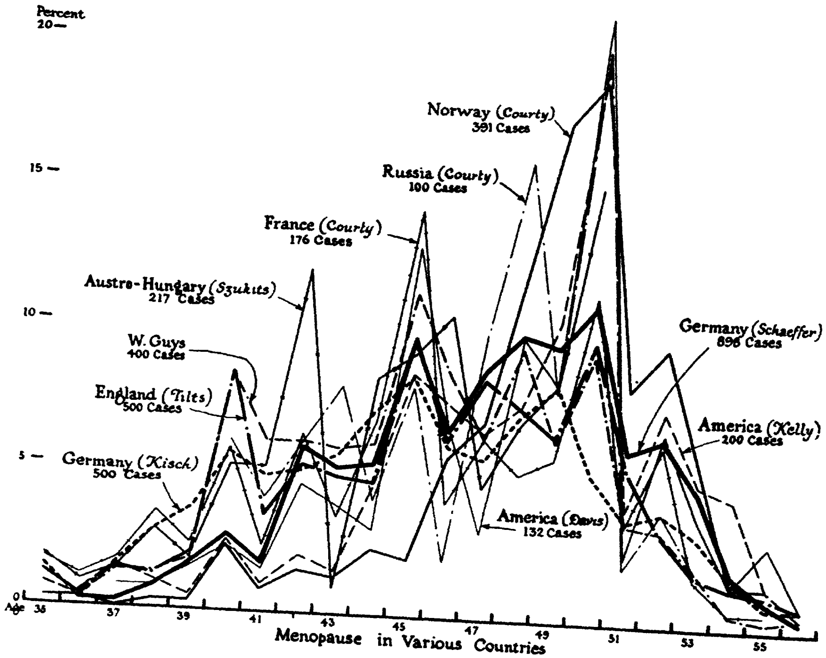
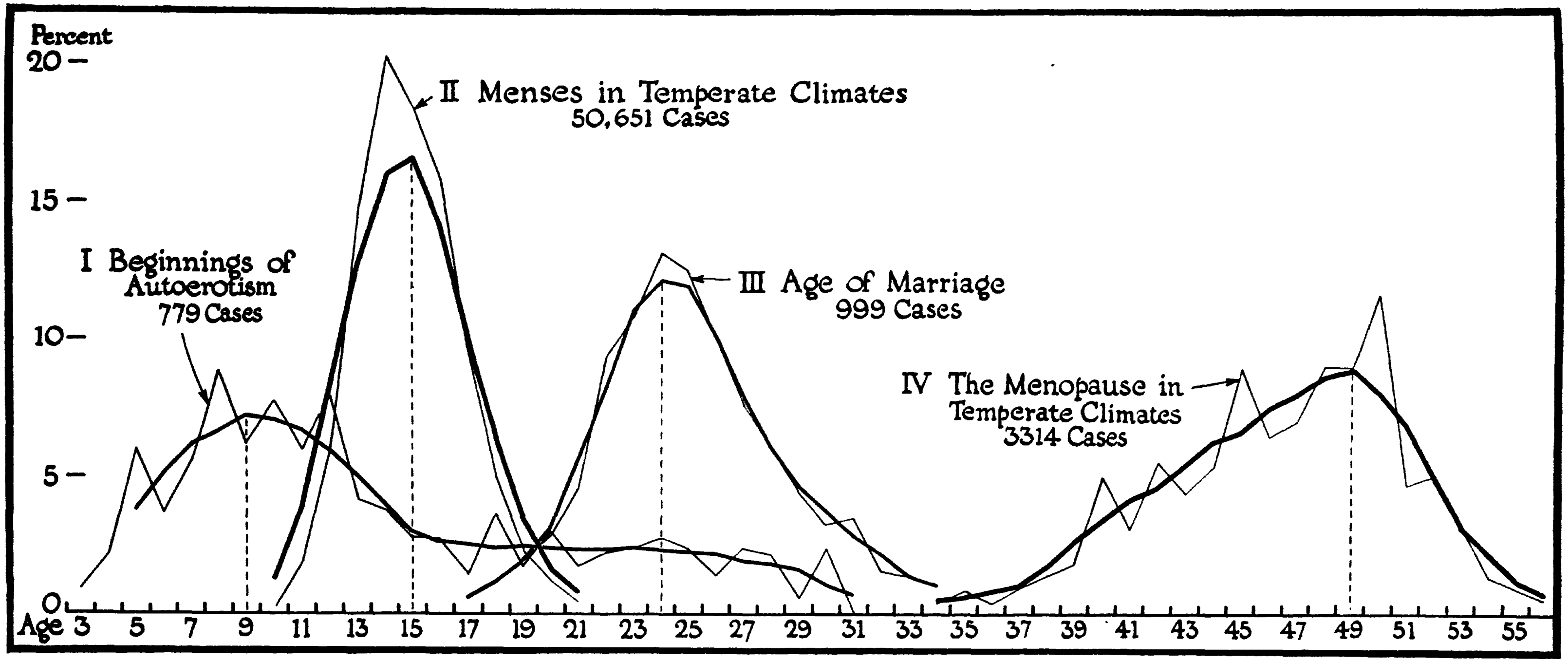
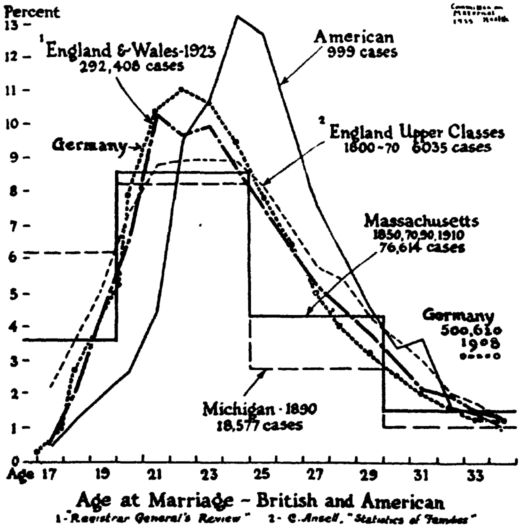


Fig. 47a

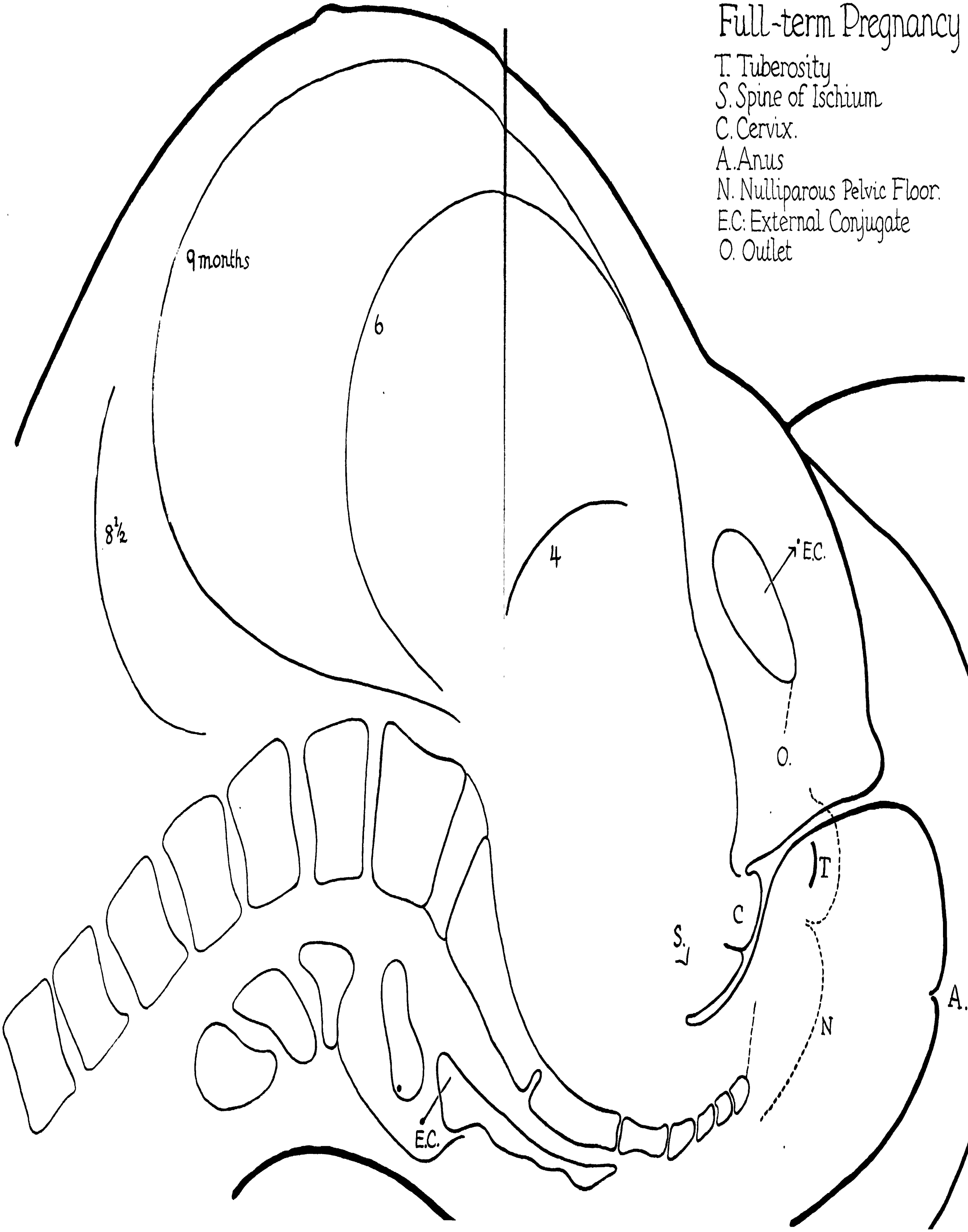


Average Sex Life in Women: dark lines, smoothed curves



1-"Registrar General's Review" 2- C. Ansell, "Statistics of Families"

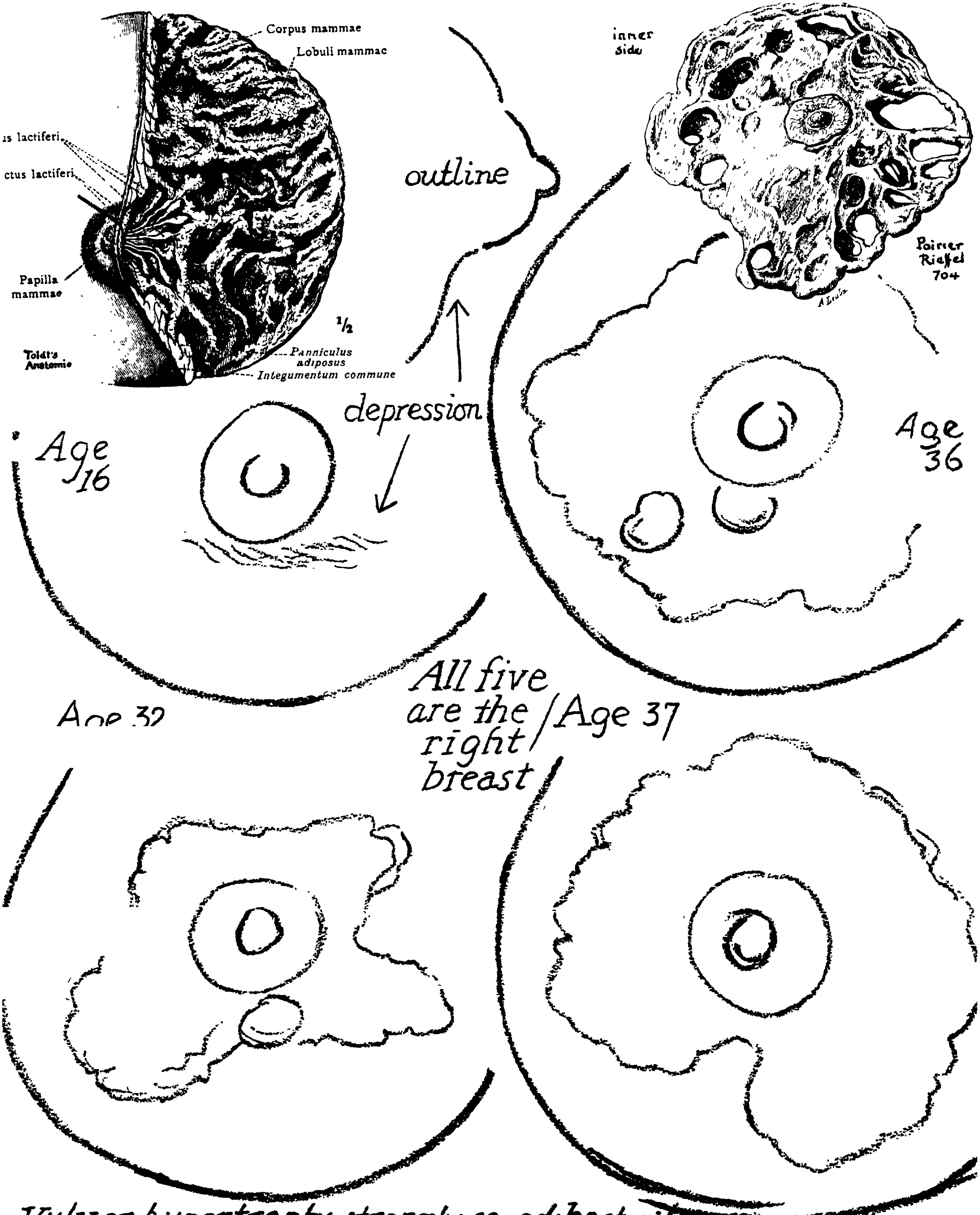
Fig. 47



Full-term Pregnancy

T. Tuberosity
S. Spine of Ischium
C. Cervix.
A. Anus
N. Nulliparous Pelvic Floor.
E.C: External Conjugate
O. Outlet

Fig.



Vulvar hypertrophy: strongly sexed: hesterile

"Chronic mastitis"; changes in shape.

RLD

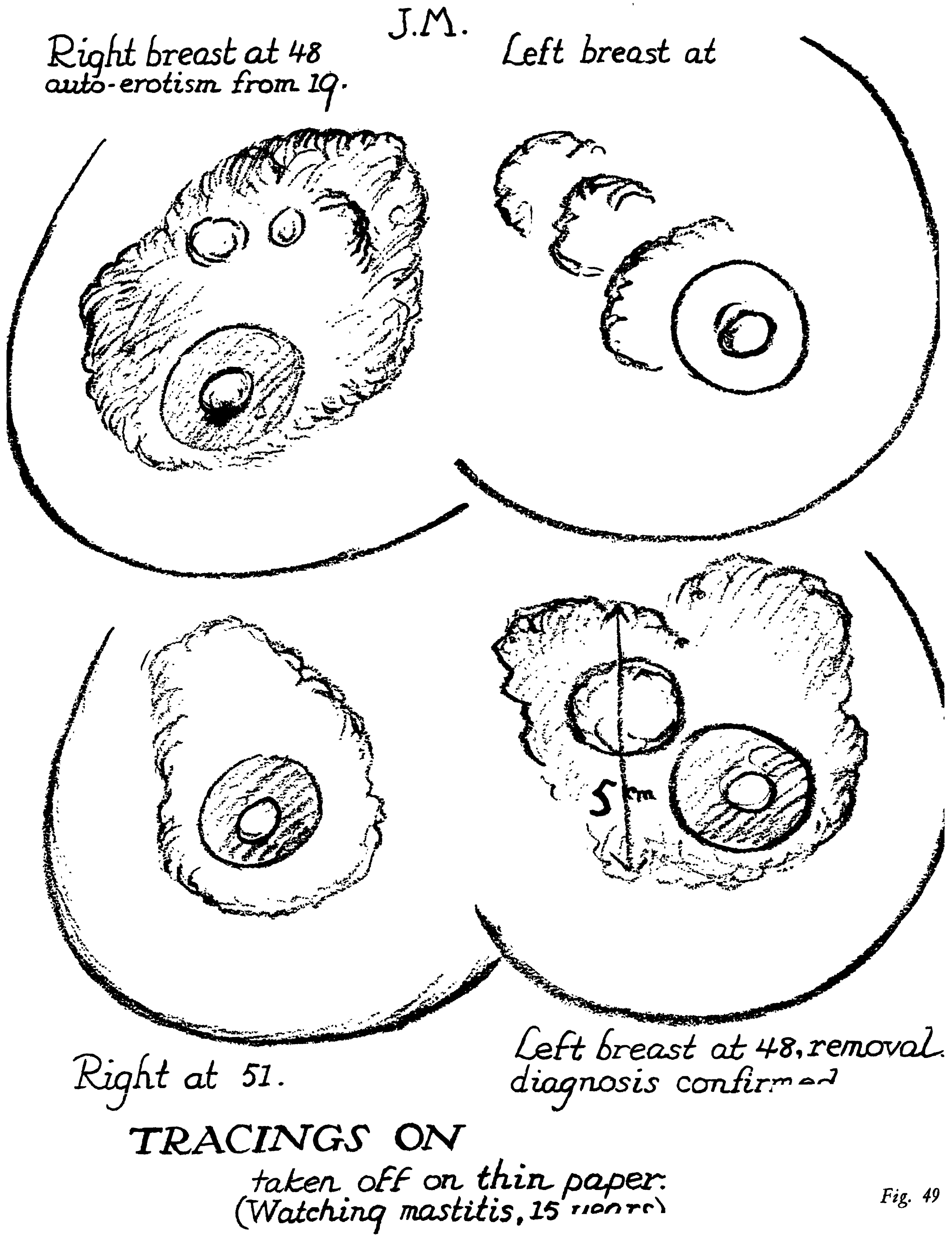
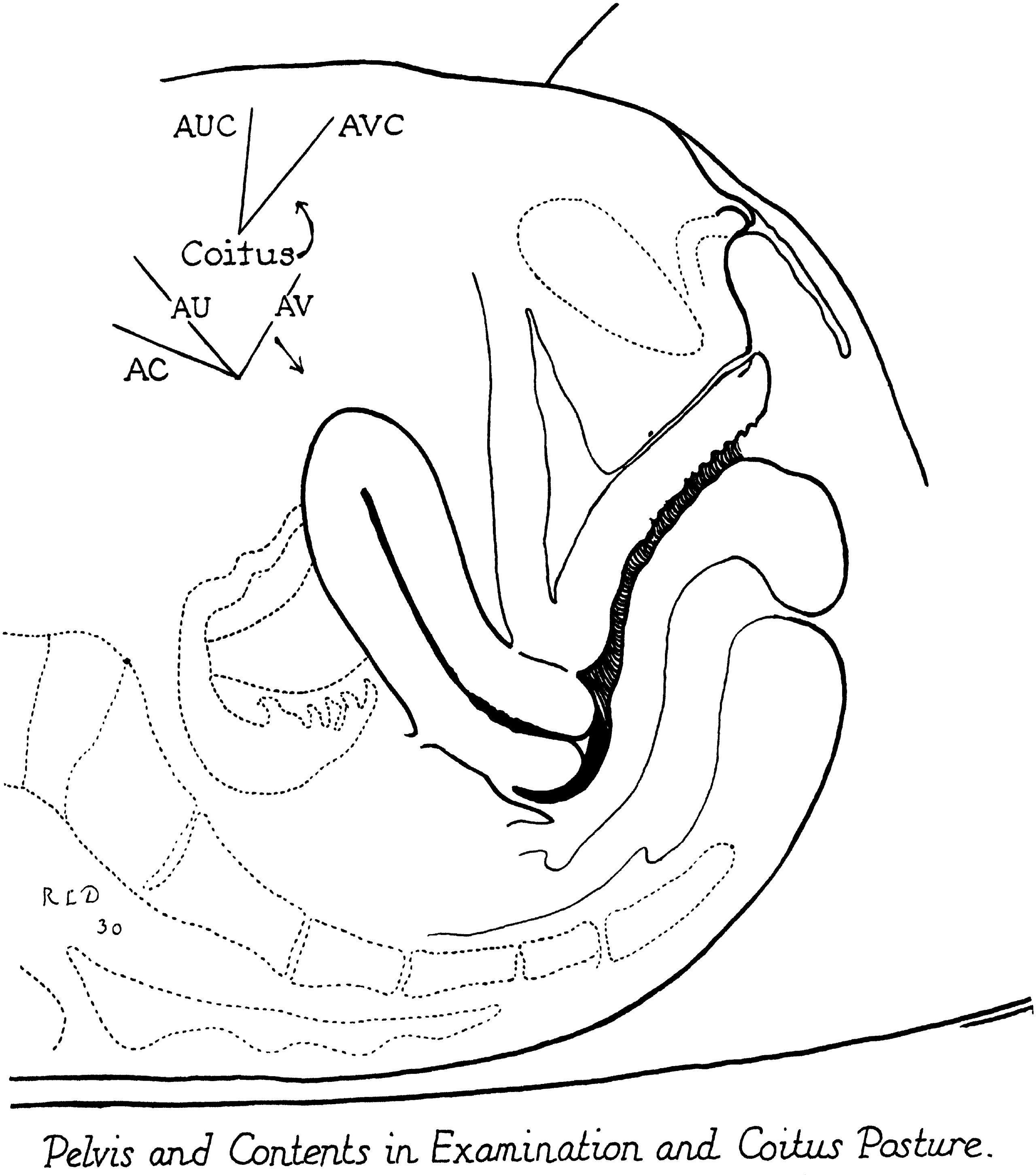

J.M.
Right breast at 48
auto-erotism from 19.
Left breast at
5 cm
Right at 51.
Left breast at 48, removal.
diagnosis confirmed
TRACINGS ON
taken off on thin paper.
(Watching mastitis, 15 years)

Fig. 49

CHAPTER IV

THE VAGINA

Text and commentary pages 34 to 39
Figures 50 to 69



Pelvis and Contents in Examination and Coitus Posture.
Angles between vaginal and uterine canals, AU, AV; changed in coitus to AUC, AVC.

Fig. 50

Axis of Vagina
compared to outlet

The general axis is 30° in vagina AA
The upper middle, 10°
The extremes in defunct
vaginas are shown at BB & CC
but axes not very different

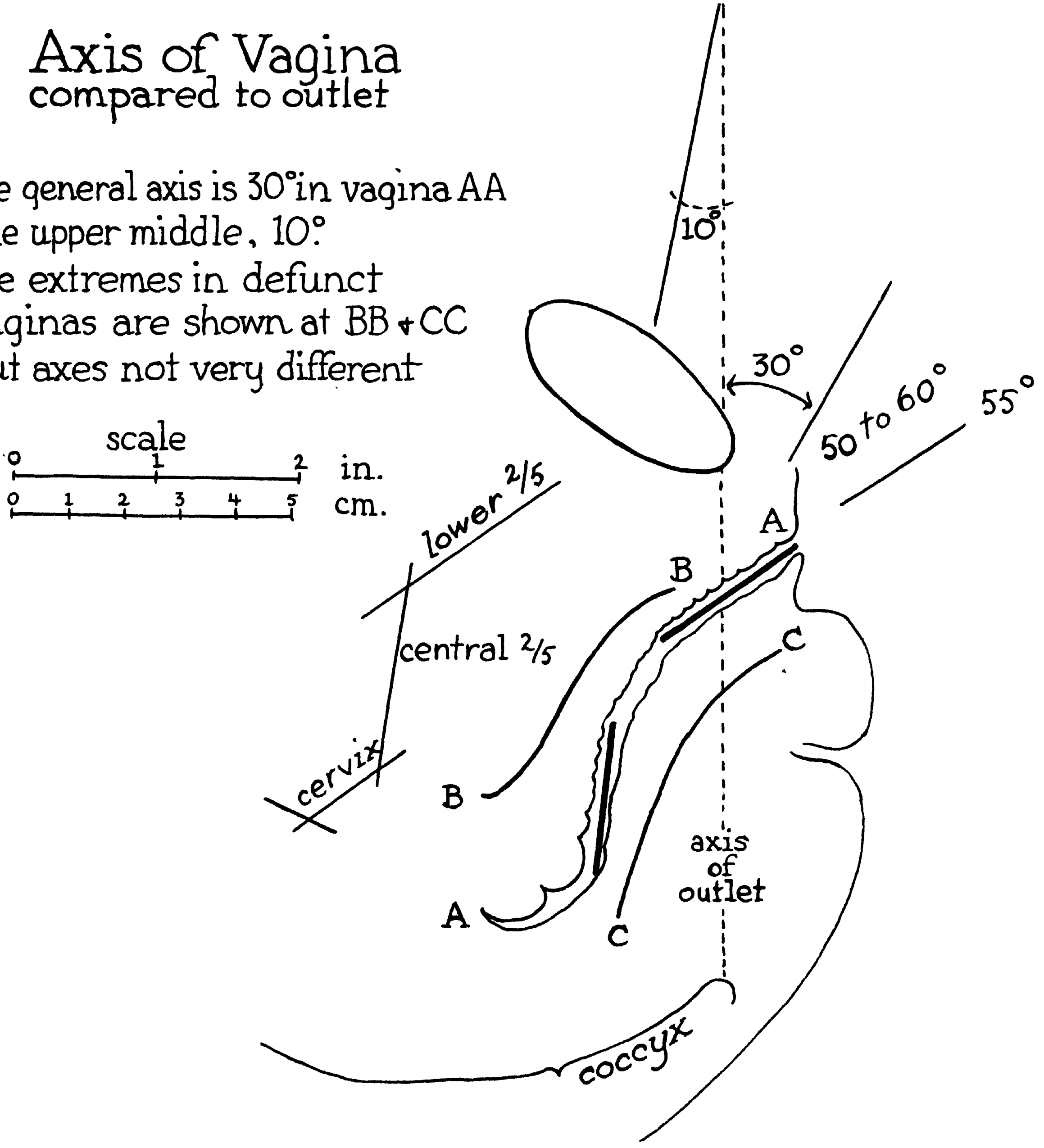
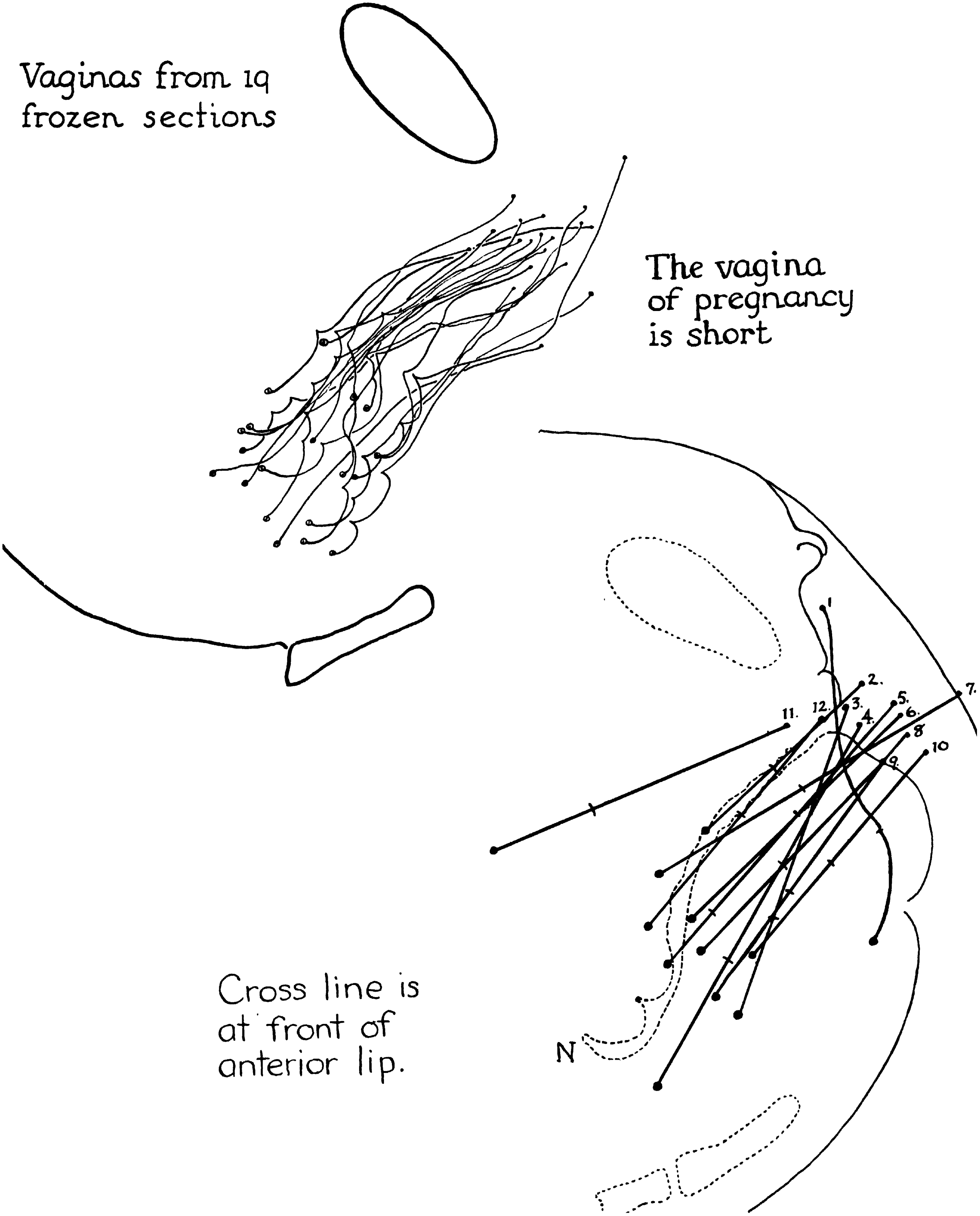


Fig. 51

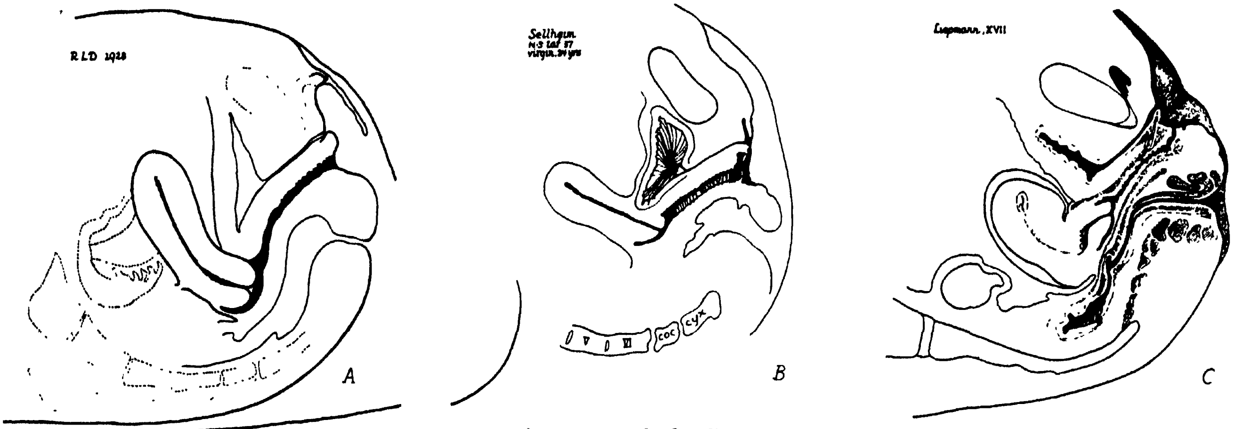


Vaginas from 19 frozen sections

The vagina of pregnancy is short

Cross line is at front of anterior lip.

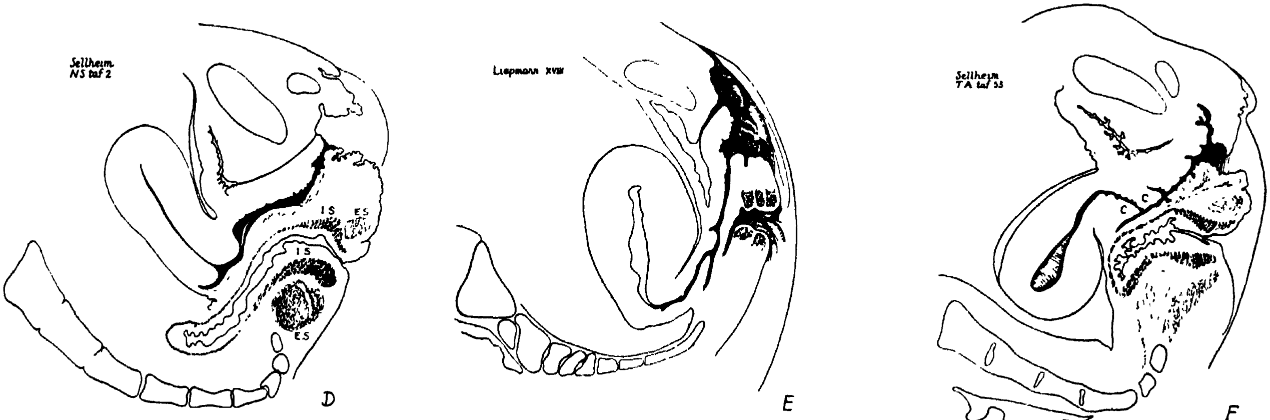
Fig. 52



Normal Vagina of the living

Short vagina of infantilism
Post-mortem gape of anus

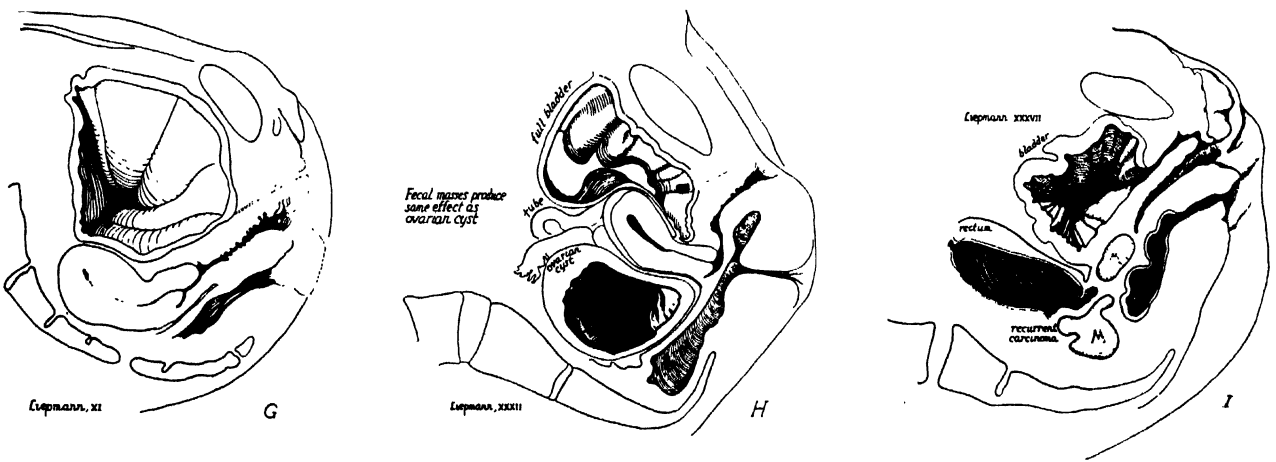
Short vagina in cervical anteflexion



Post-partum curvatures of vagina
and relaxed pelvic floor

Short, displaced post-partum vagina
Sagged uterus anteflexed

Short vagina of retroflexion (or version)



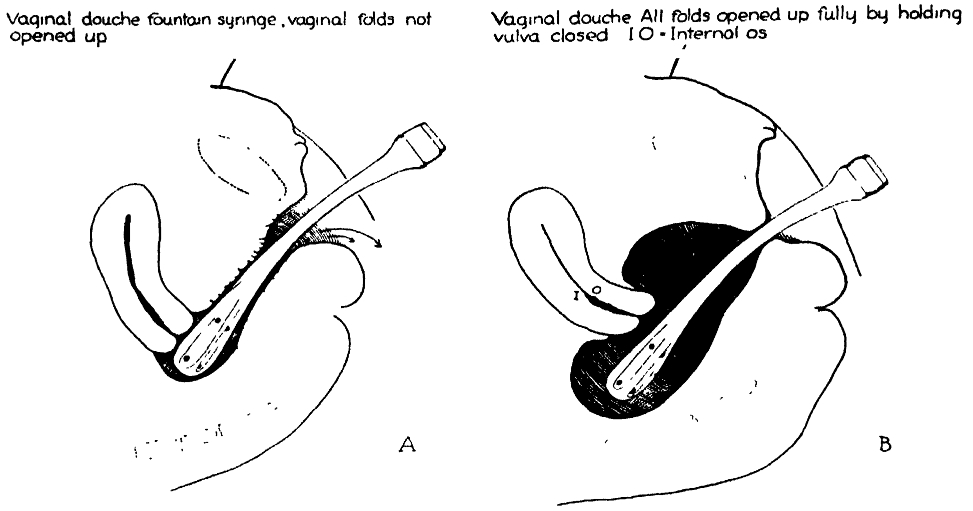
Short, displaced vagina
with bladder distended

Short, displaced vagina
ovarian cyst; rectocele

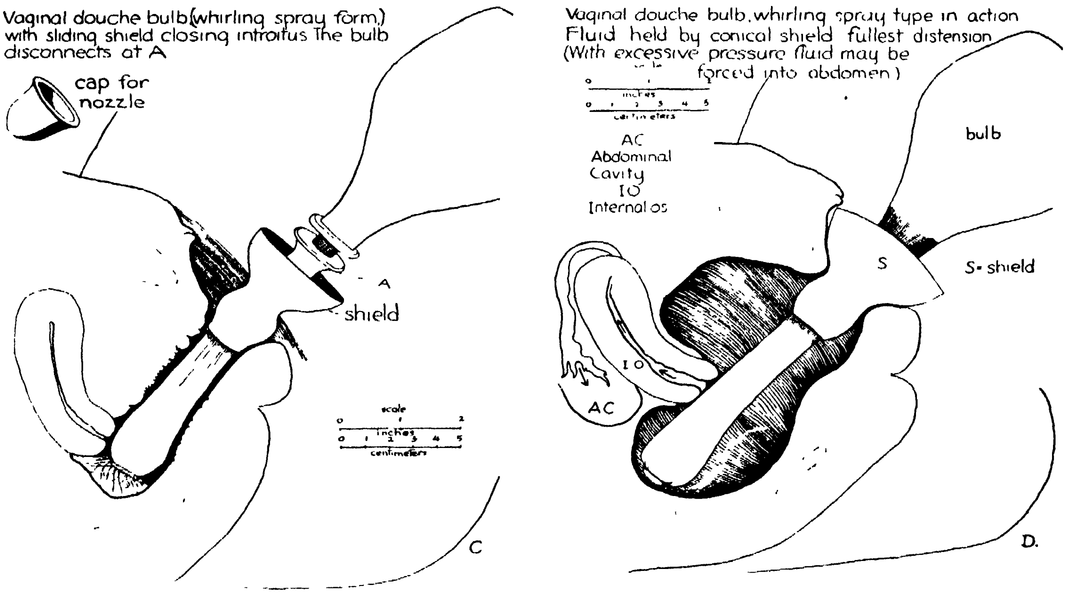
Short vagina after
complete hysterectomy

Shortened and Displaced Vaginas
from Sellheim and Liepmann, modified by closing the anus

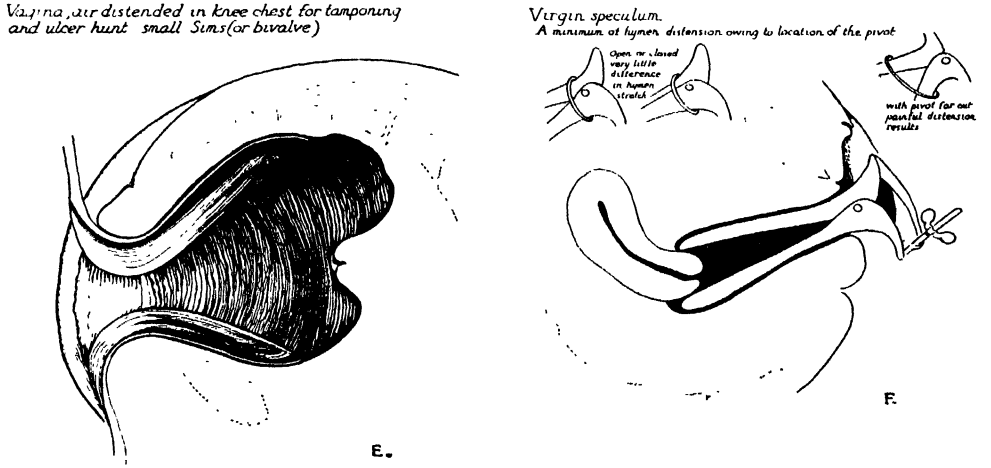
Fig. 53


Vaginal douche fountain syringe, vaginal folds not opened up

Vaginal douche All folds opened up fully by holding vulva closed IO - Internal os


Vaginal douche bulb (whirling spray form) with sliding shield closing introitus The bulb disconnects at A

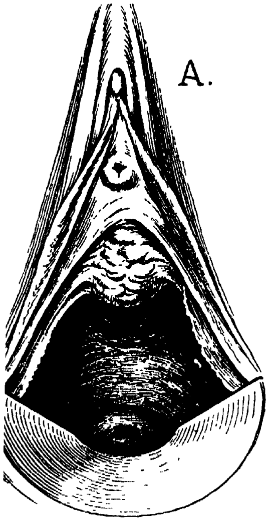
Vaginal douche bulb, whirling spray type in action Fluid held by conical shield fullest distension (With excessive pressure fluid may be forced into abdomen)


Vagina, air distended in knee chest for tamponing and ulcer hunt small Sims (or bivalve)

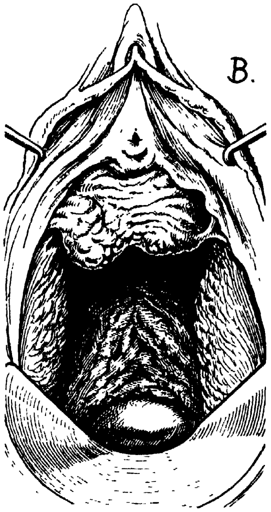
Virgin speculum.
A minimum of hymen distension owing to location of the pivot

Open or closed very little difference in hymen stretch
with pivot far out painful distension results
E.
F.

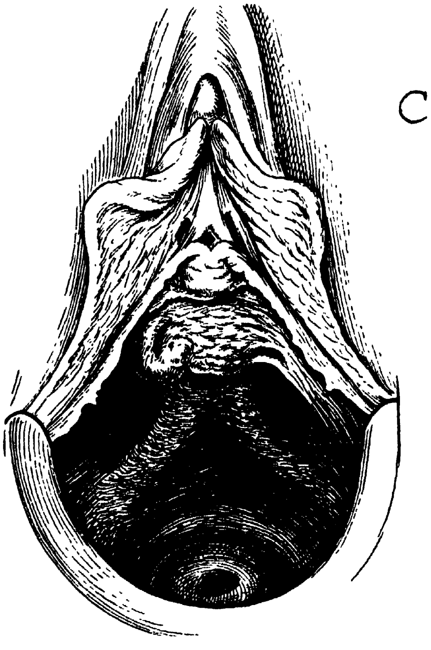
Fig. 54



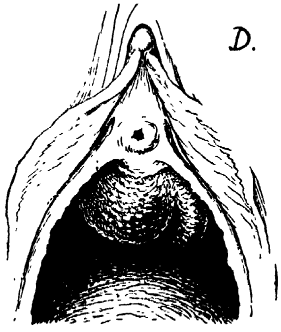
20 year old nullipara
central ridge, Jayle



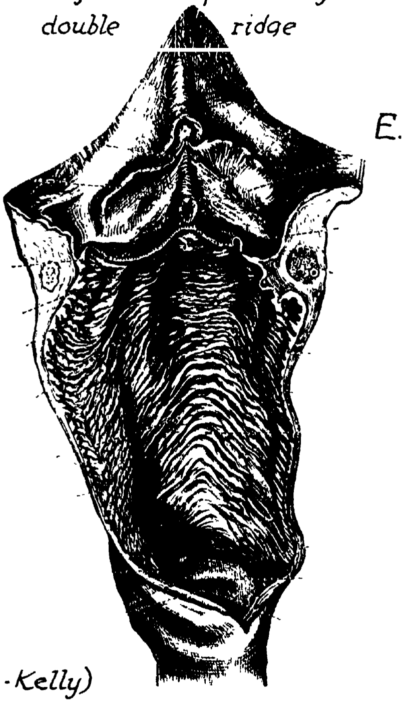
B. 26 year old II para. Jayle
double ridge

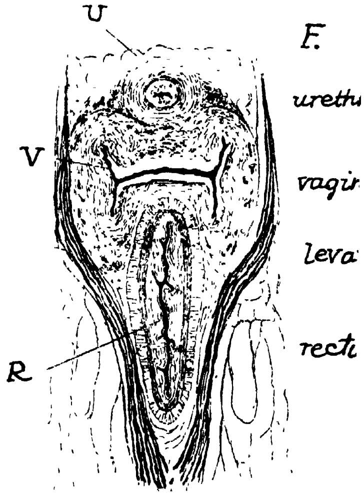


C. 20 year nullipara. Jayle
double ridge. asymmetric.



). 34 year old, I para
center + lateral ridge





Upper vaginal triangle. (Pawlik-Kelly)
shows on B, C, + E, denoting
bladder base + ureter

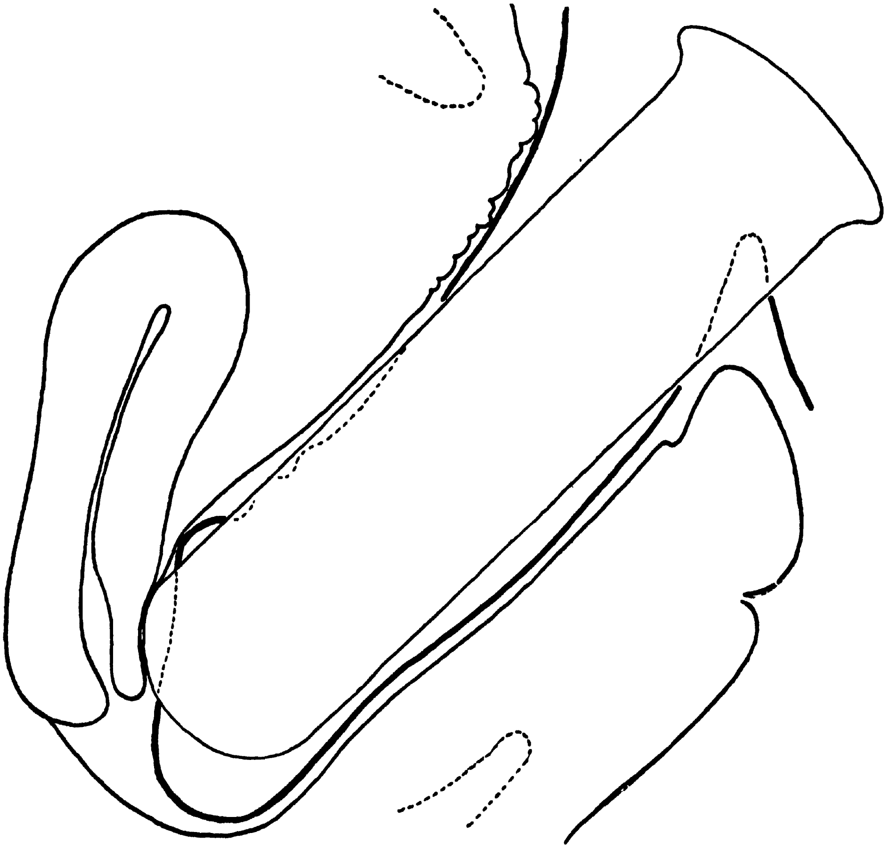
E. Folds of vagina from
hymen to cervix and
relation to hymen
Toldt

F. Collapsed vagina
H-shaped, + rectum=
I-shaped. Henle-

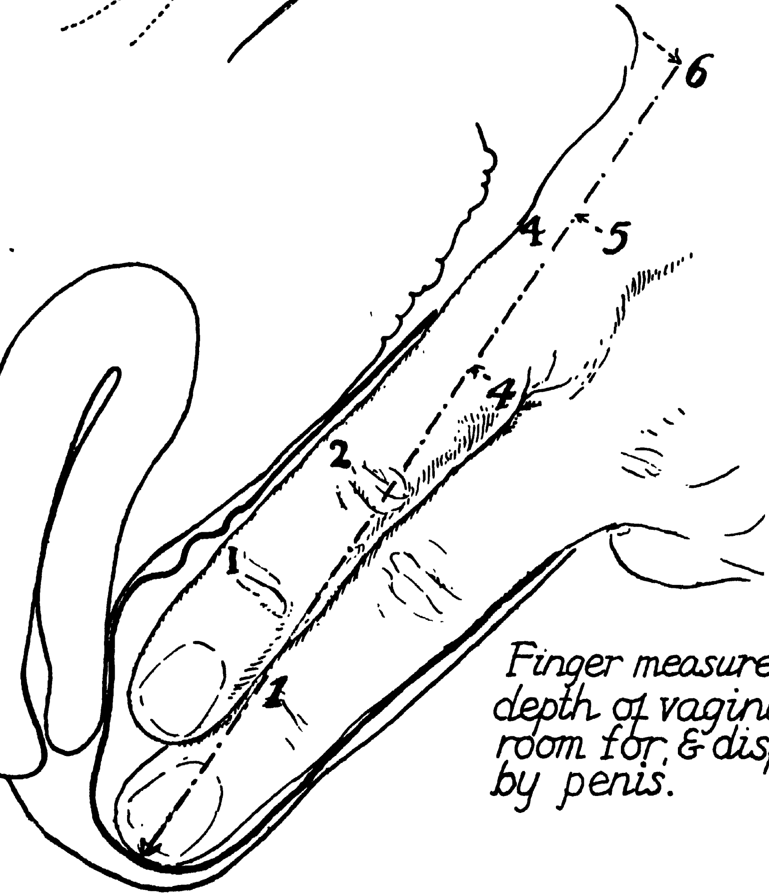
scale on all of above unknown.

Folds, (rugae), of anterior vaginal wall.
The "Reibfläche", the corrugated surface against
the corona glandis.

Fig. 55



This test tube
in average cases
gives clue to
action of penis



Finger measurement of
depth of vagina showi
room for, & displaceme
by penis.

Vaginal Distensibilities.

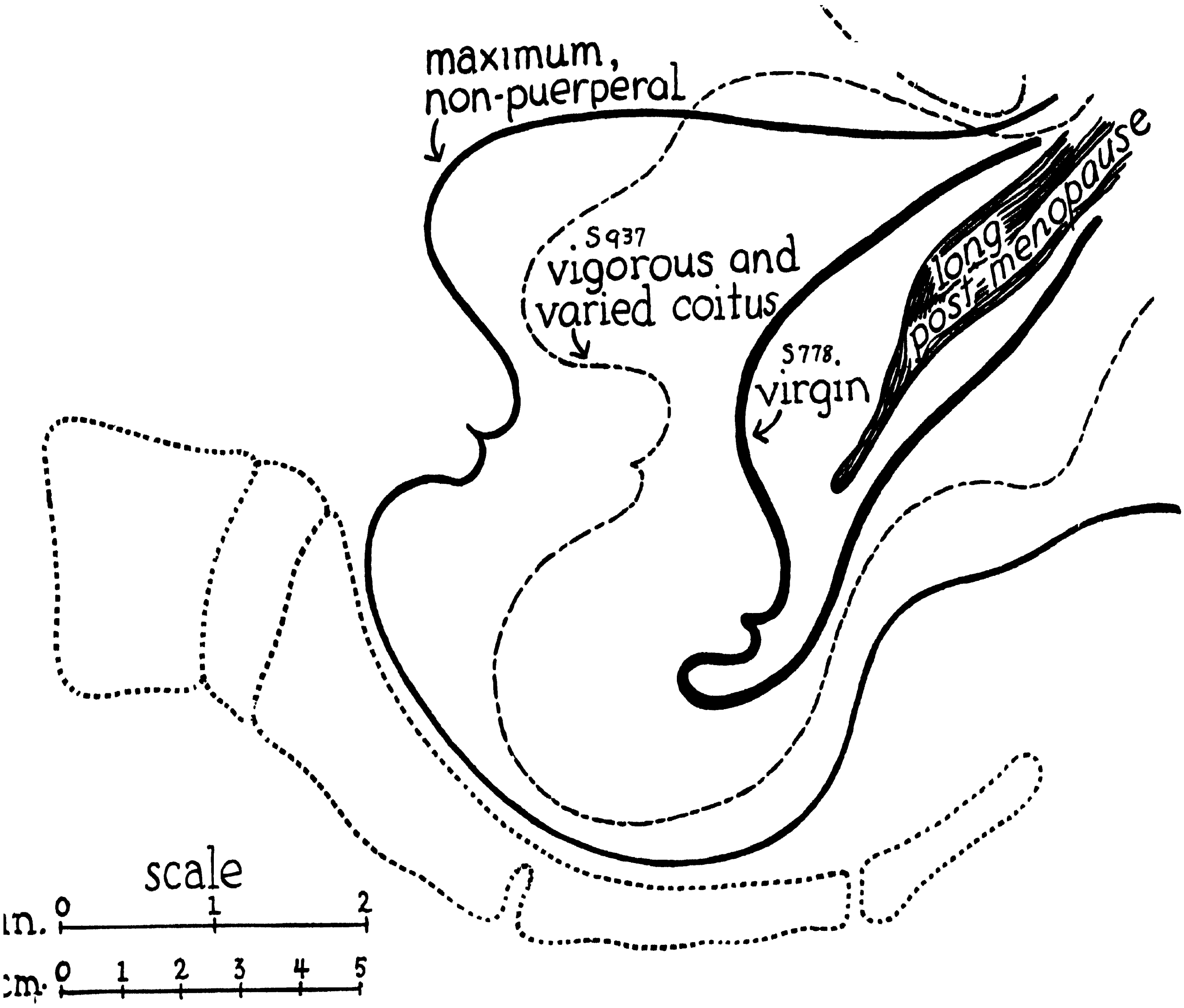


Fig. 57

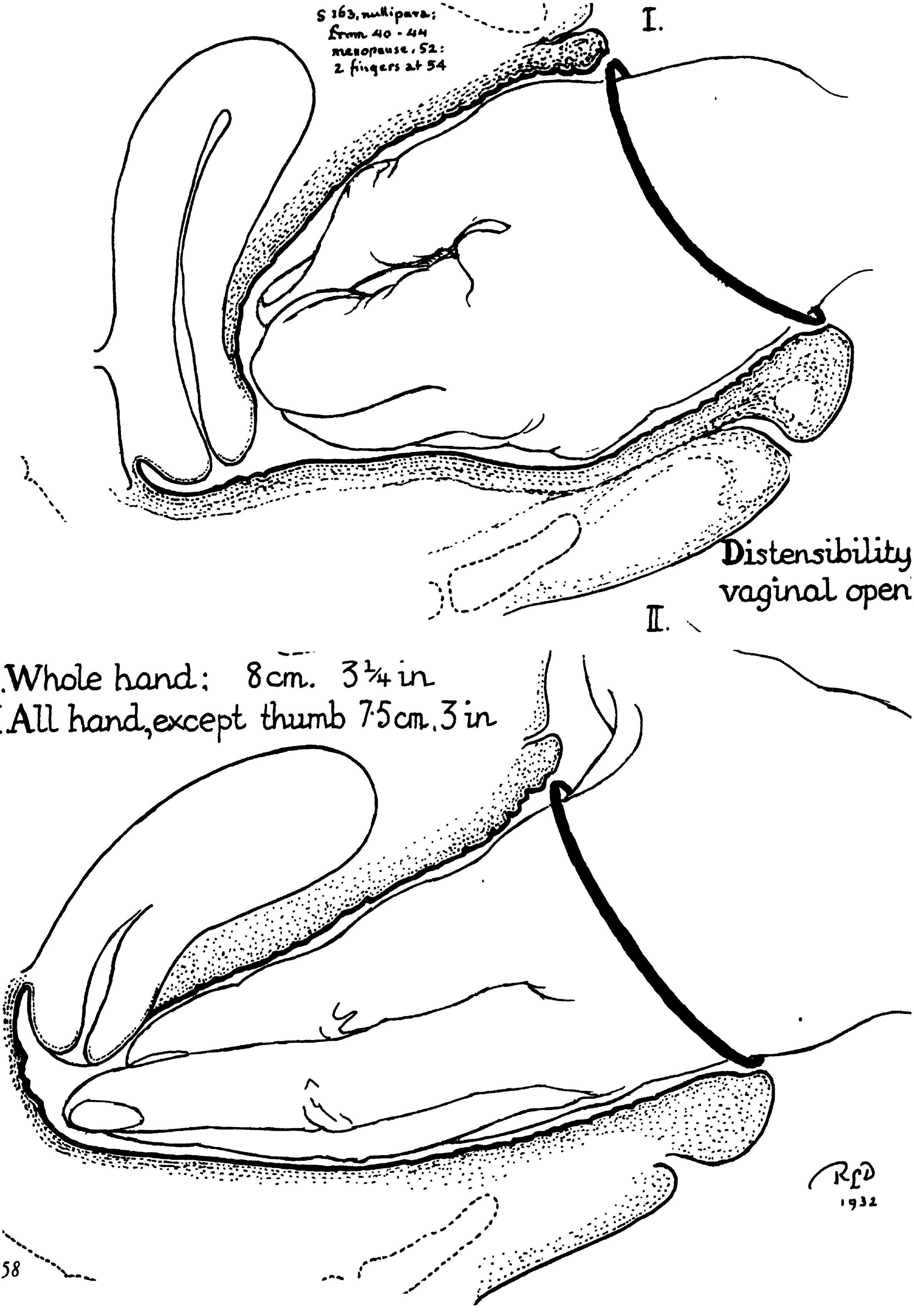
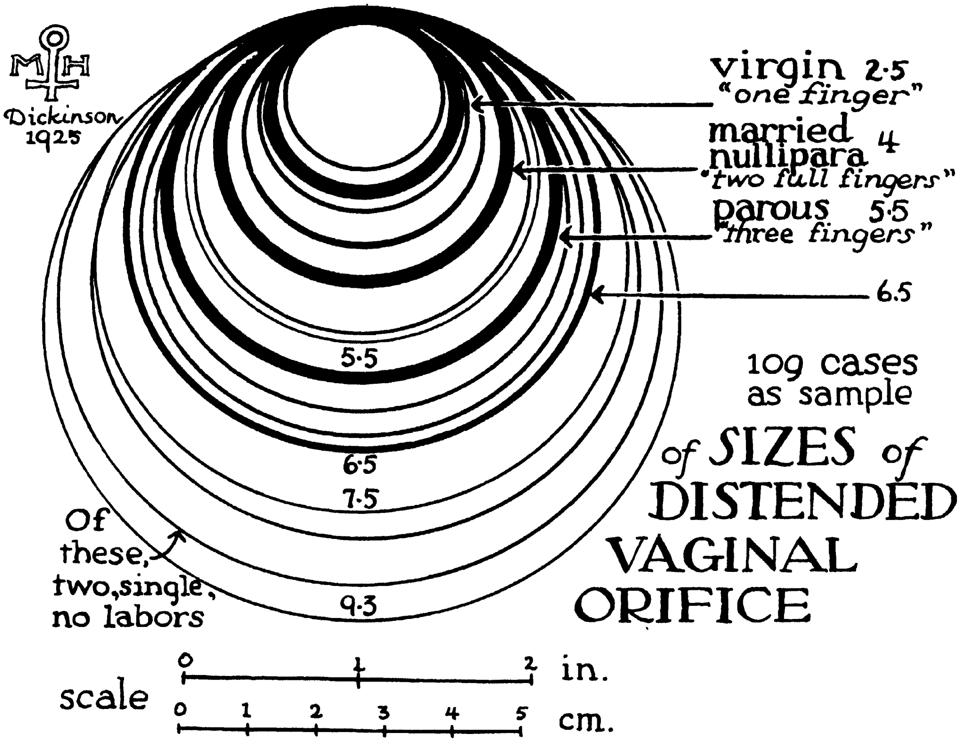
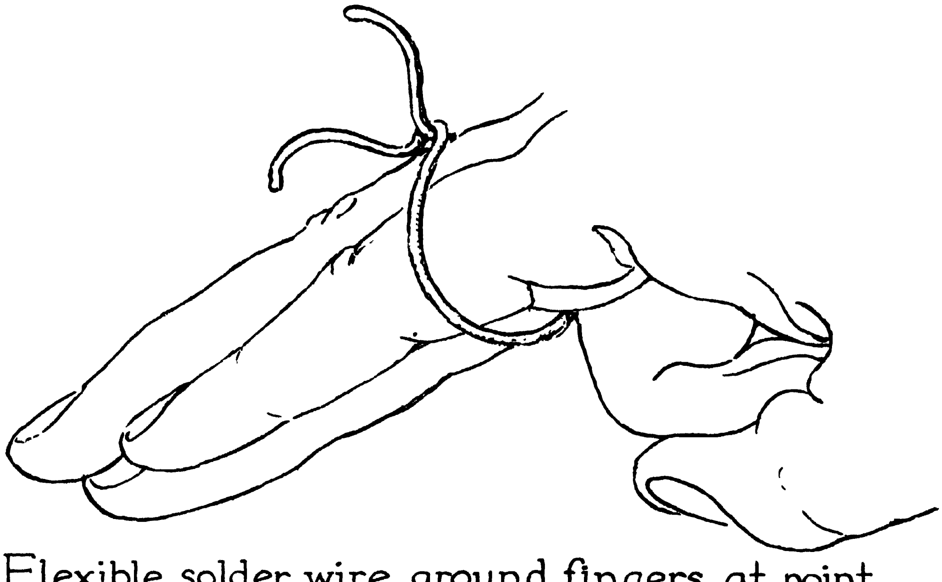

S 163, nullipara;
from 40 - 44
menopause, 52:
2 fingers at 54
I.
Distensibility
vaginal open
II.
I. Whole hand: 8cm. 3¼ in
II. All hand, except thumb 7.5cm. 3 in
RLD
1932

Fig. 58

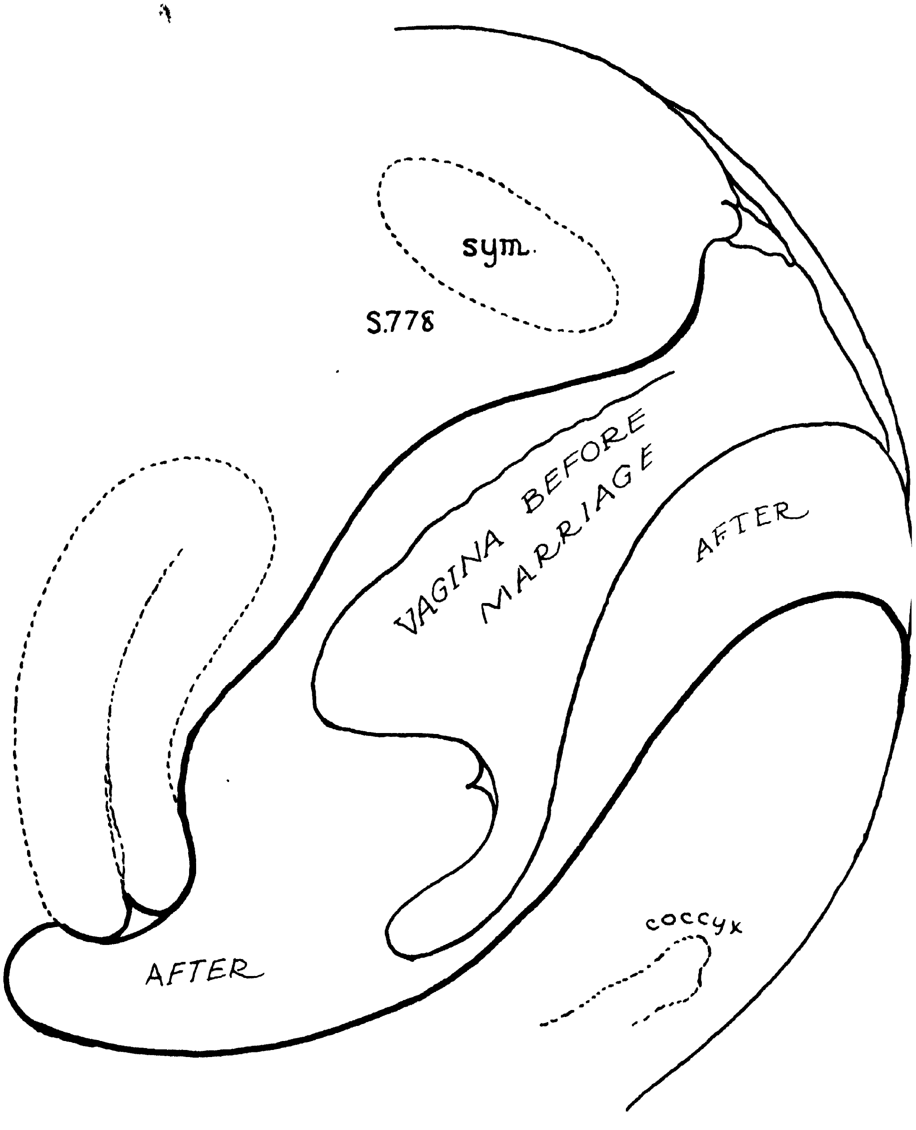




Flexible solder wire, around fingers at point where hymen stopped their entry, measures circumference of introitus.

Fig. 59

Virgin Vagina
from Hart.



Vagi
before &
after
marriage

Fig. 60

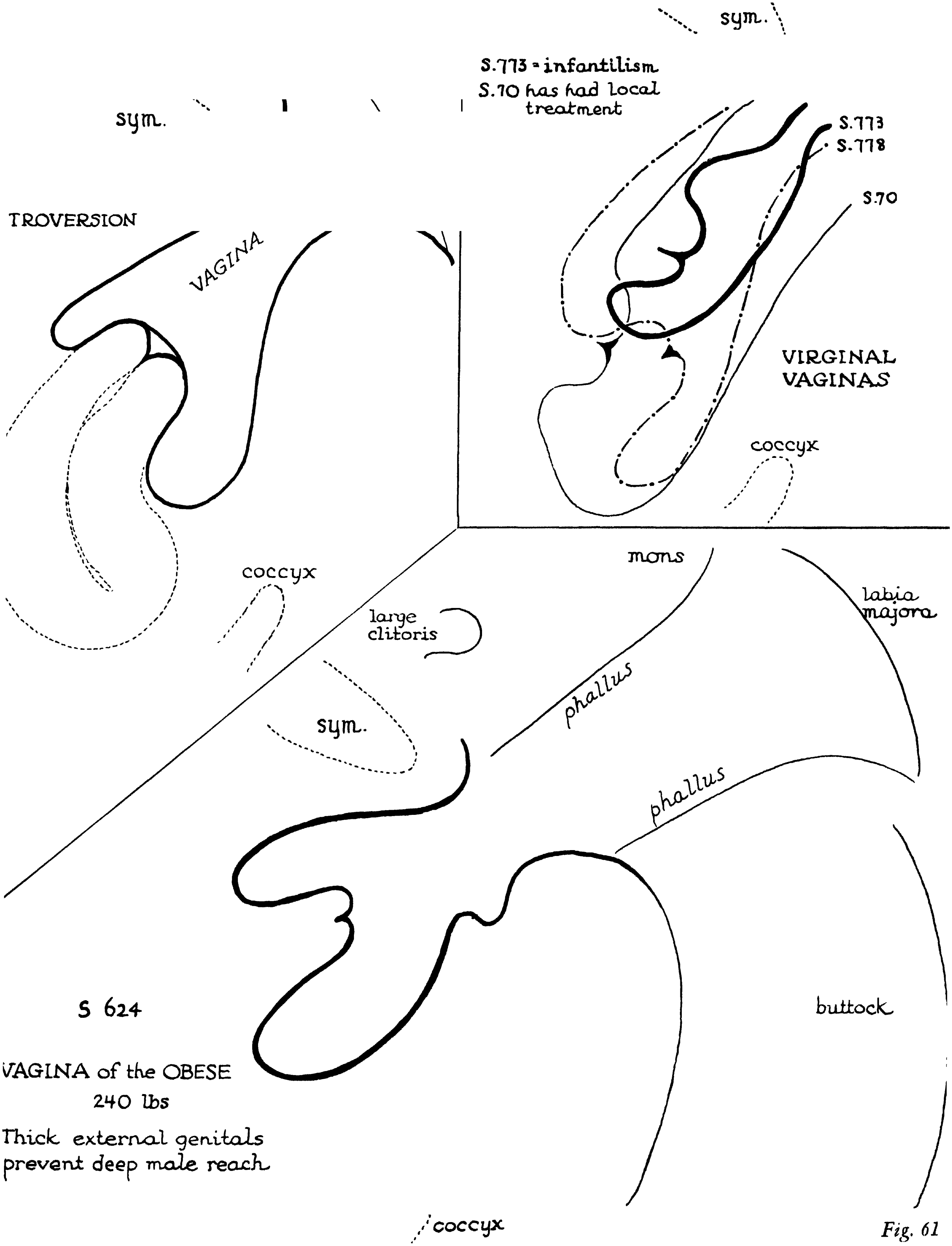

sym.
S.773 = infantilism
S.70 has had local treatment
sym.
S.773
S.778
S.70
TROVERSION
VAGINA
VIRGINAL VAGINAS
coccyx
coccyx
mons
labia majora
large clitoris
phallus
sym.
phallus
S 624
buttock
VAGINA of the OBESE
240 lbs
Thick external genitals prevent deep male reach
coccyx

Fig. 61

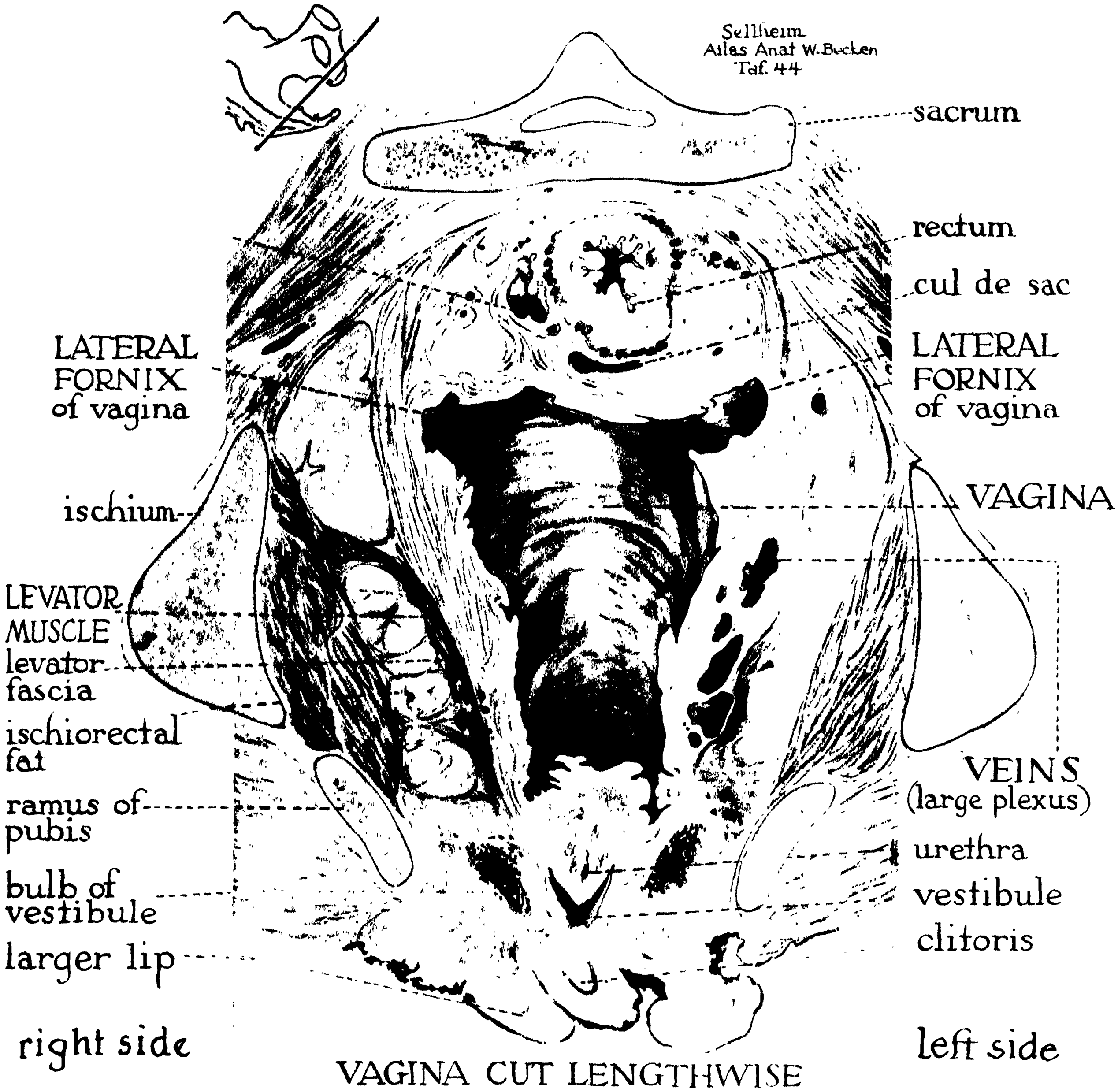
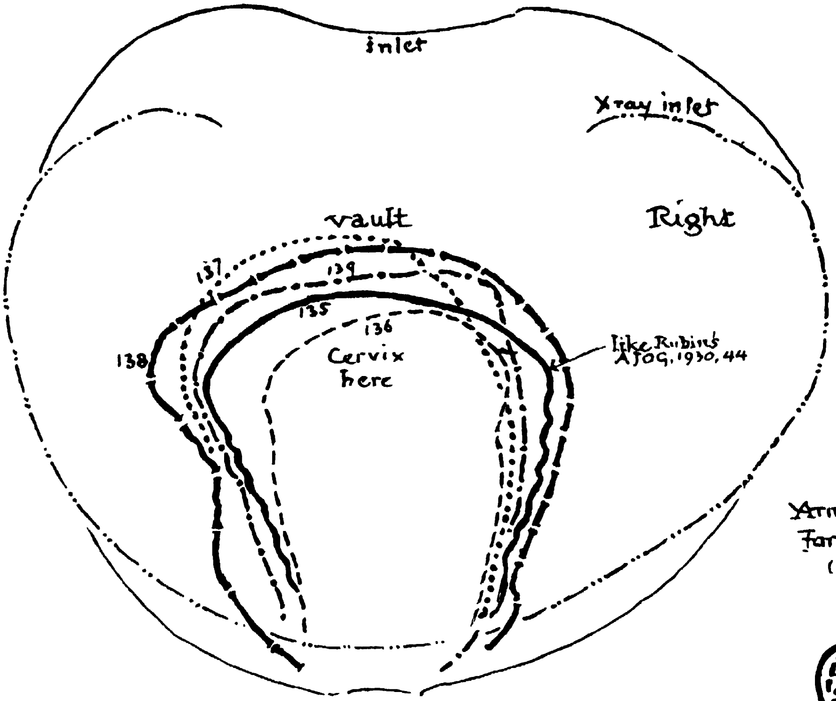
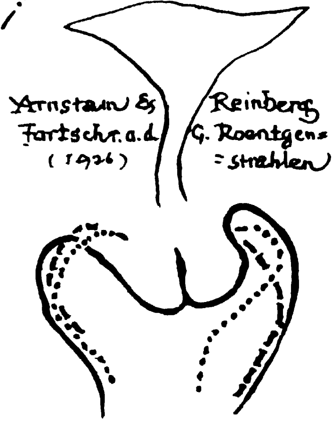

Sellheim
Atlas Anat W.Becken
Taf. 44
sacrum
rectum
cul de sac
LATERAL FORNIX of vagina
LATERAL FORNIX of vagina
VAGINA
ischium
LEVATOR MUSCLE
levator fascia
ischiorectal fat
VEINS (large plexus)
ramus of pubis
urethra
bulb of vestibule
vestibule
clitoris
larger lip
right side
left side
VAGINA CUT LENGTHWISE

Fig. 62



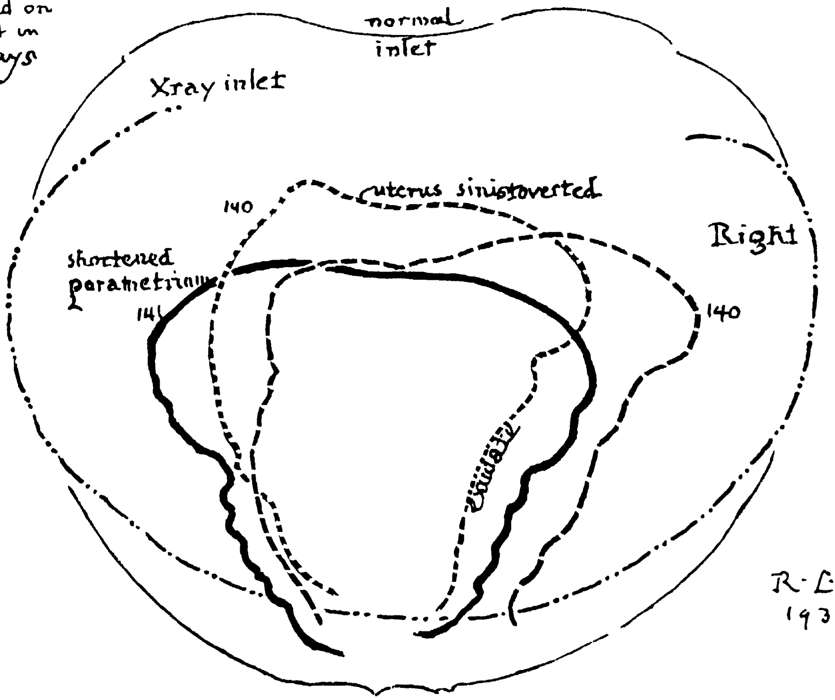
Life size

Distended normal vaginas from Jarcho's Gynecological Roentgenology
(enlarged from halftones)



Relaxed vaginas
three typical examples
Breadth
5 to 6, or even 7-8 cm.
A. & R.

based on inlet in Xrays

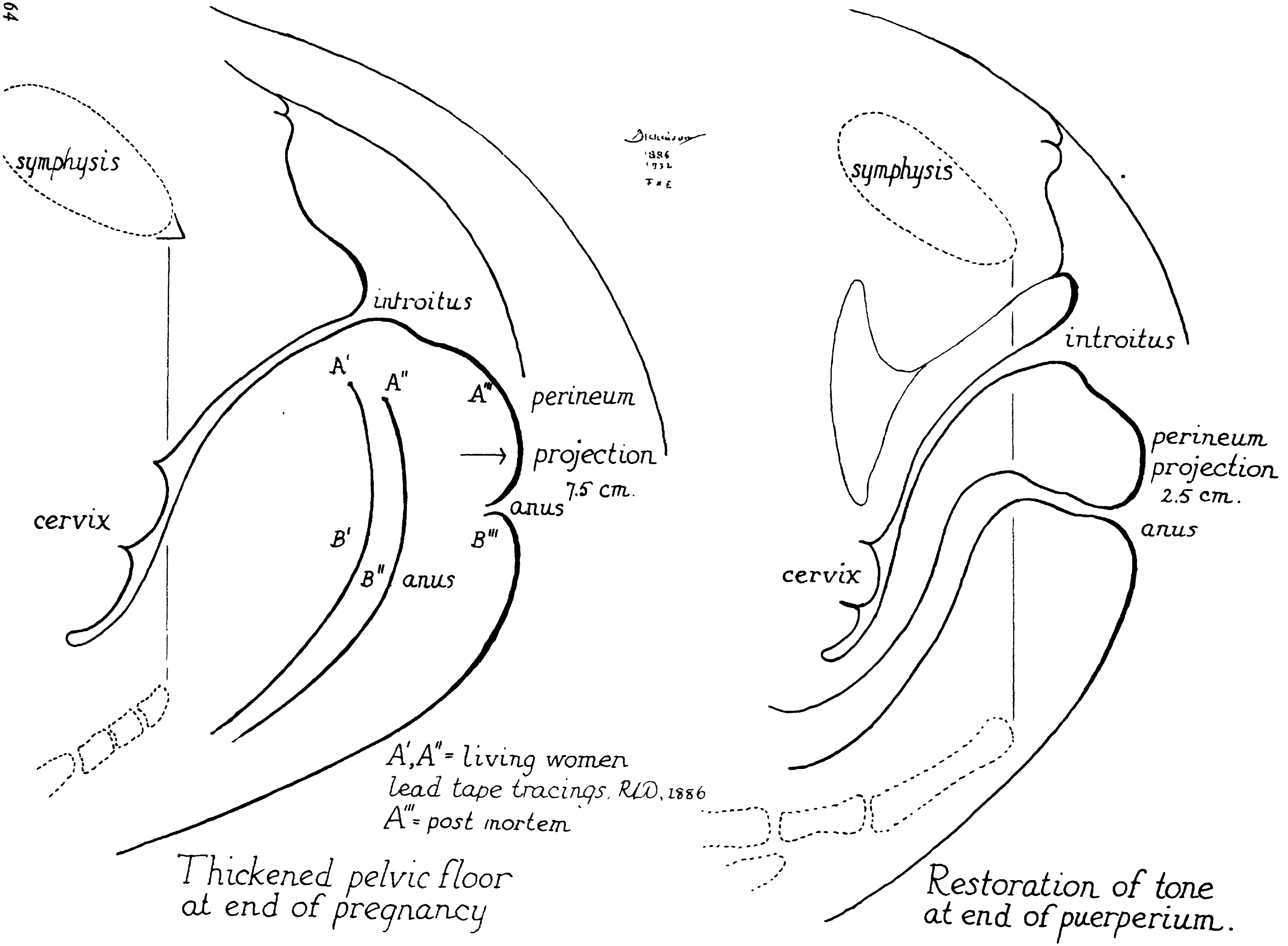


R. L. D.
1932

Distended vaginas with pelvic pathology
(Jarcho)

Fig. 63

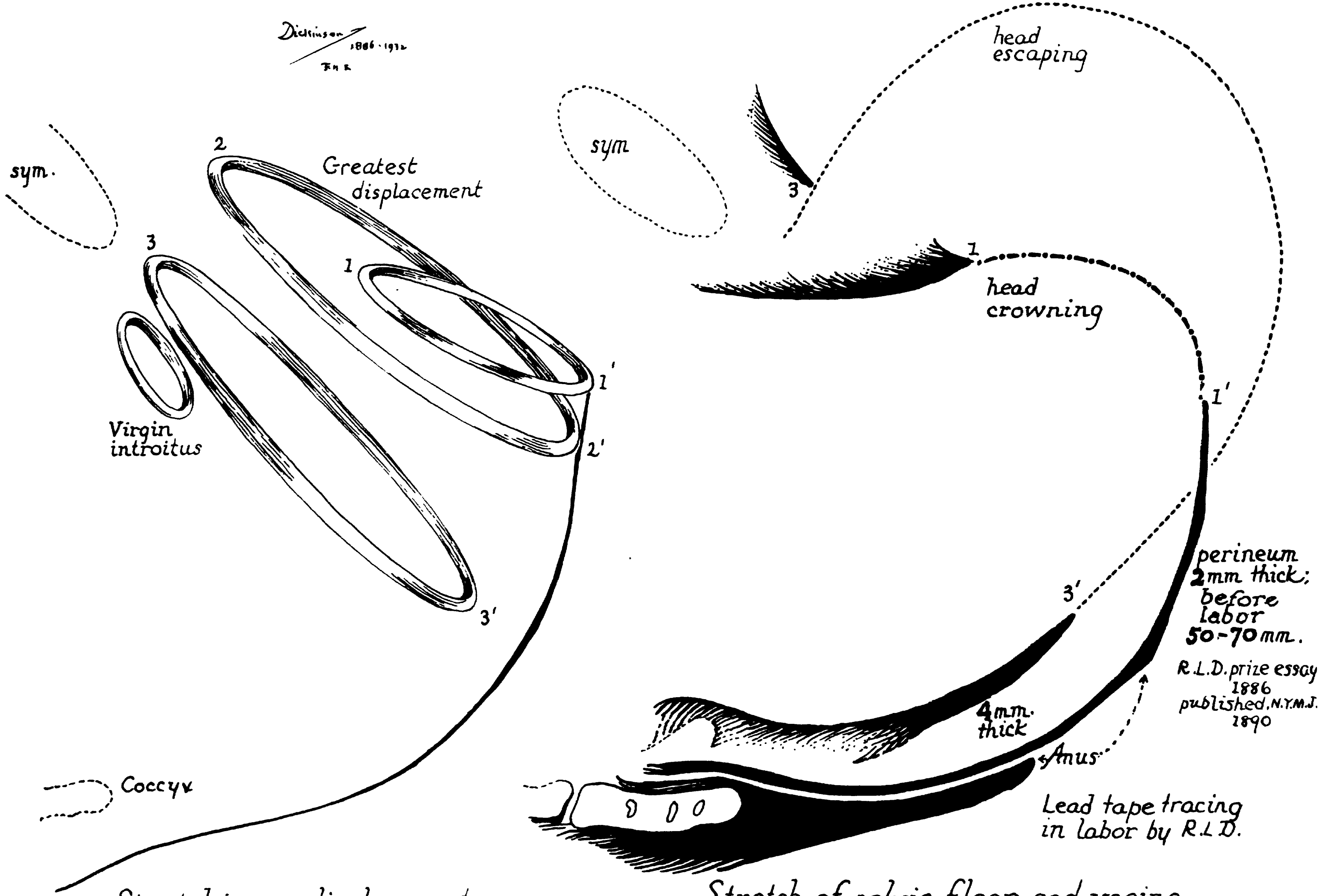
Fig. 64



A',A'' = living women
lead tape tracings, RLD, 1886
A''' = post mortem

Thickened pelvic floor
at end of pregnancy

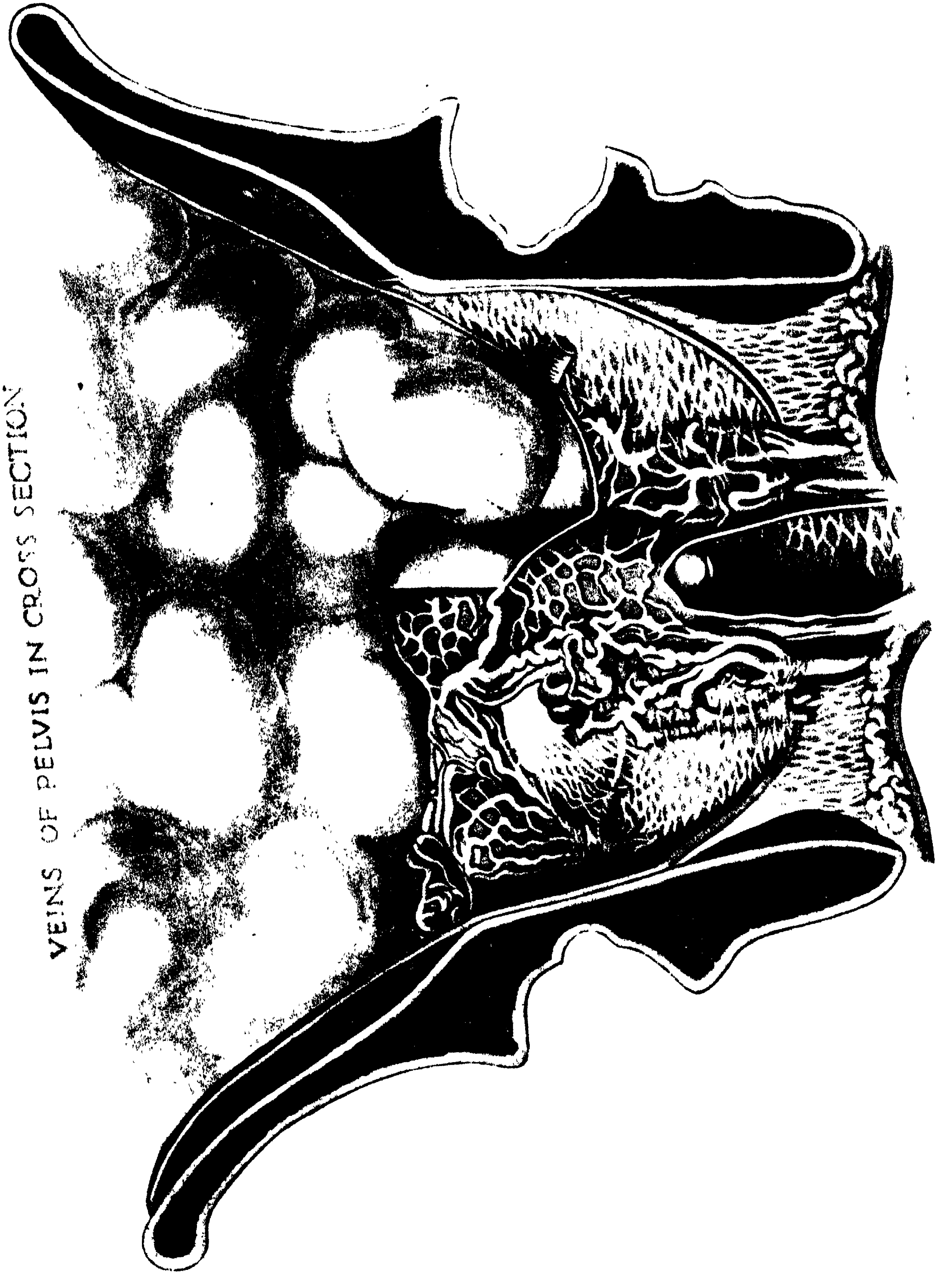
Restoration of tone
at end of puerperium.


Dickinson 1886·1932
sym.
2
Greatest displacement
3
1
1'
Virgin introitus
2'
3'
Coccyx
head escaping
sym
3
1
head crowning
1'
perineum 2mm thick; before labor 50-70mm.
R.L.D. prize essay 1886 published. N.Y.M.J. 1890
3'
4mm. thick
Anus
Lead tape tracing in labor by R.L.D.

Stretching & displacement of vaginal opening in labor.

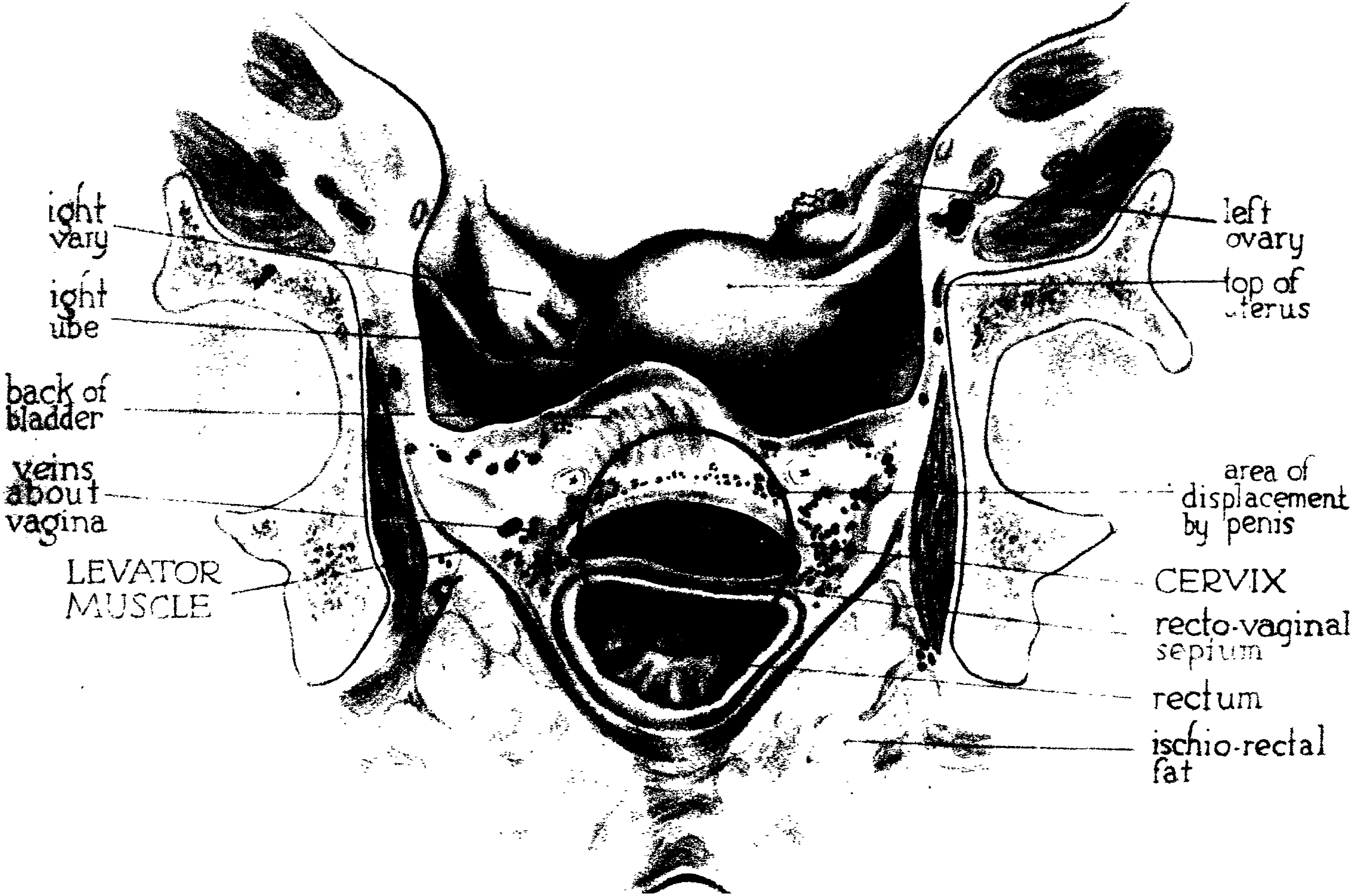
Stretch of pelvic floor and vagina at end of labor

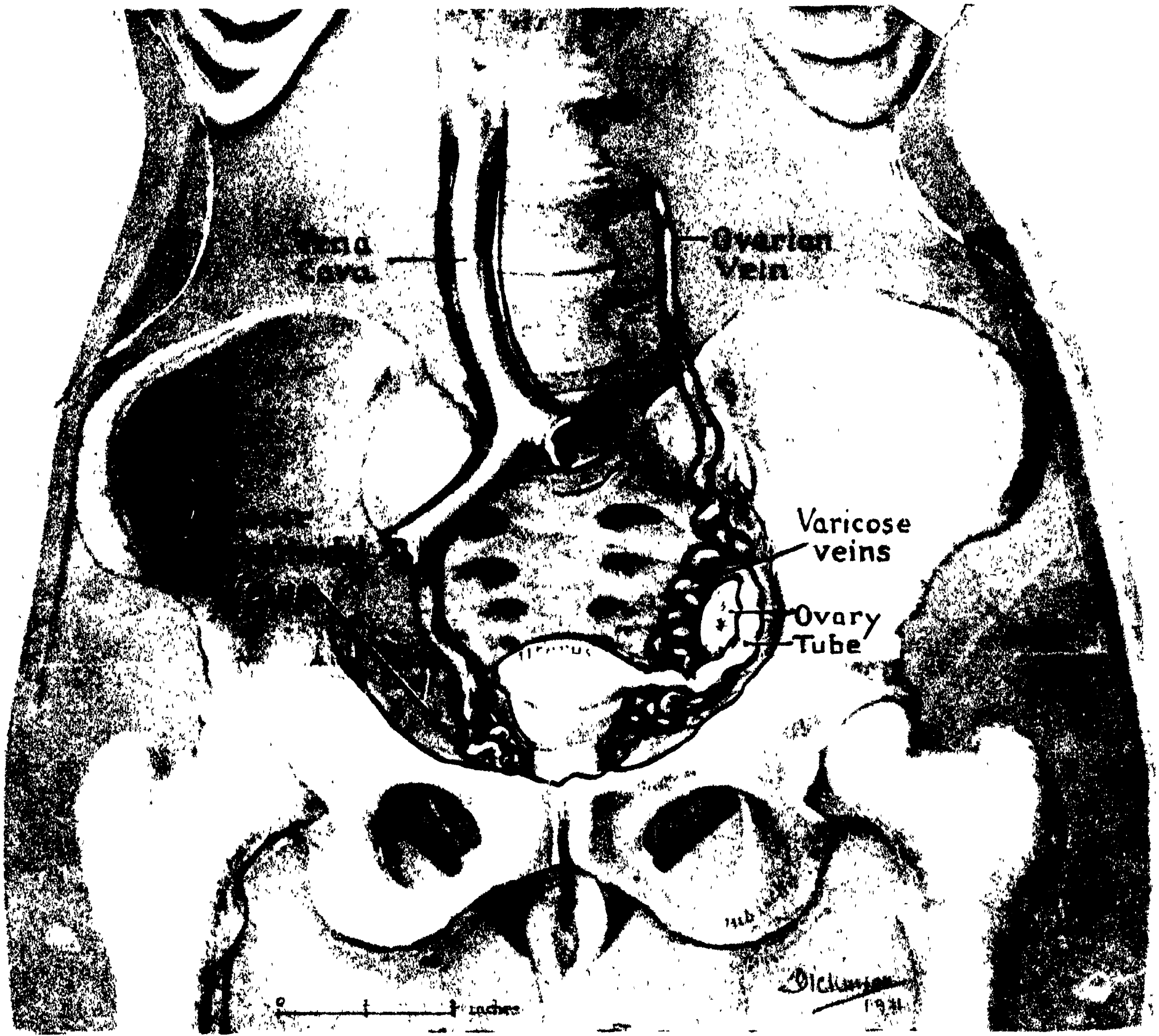
Fig. 65



VEINS OF PELVIS IN CROSS SECTION

Fig. 66


ight vary
ight ube
back of bladder
veins about vagina
LEVATOR MUSCLE
left ovary
top of uterus
area of displacement by penis
CERVIX
recto-vaginal sepium
rectum
ischio-rectal fat



Varicosities of the broad ligaments

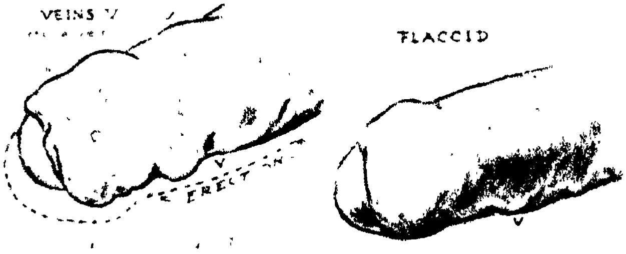
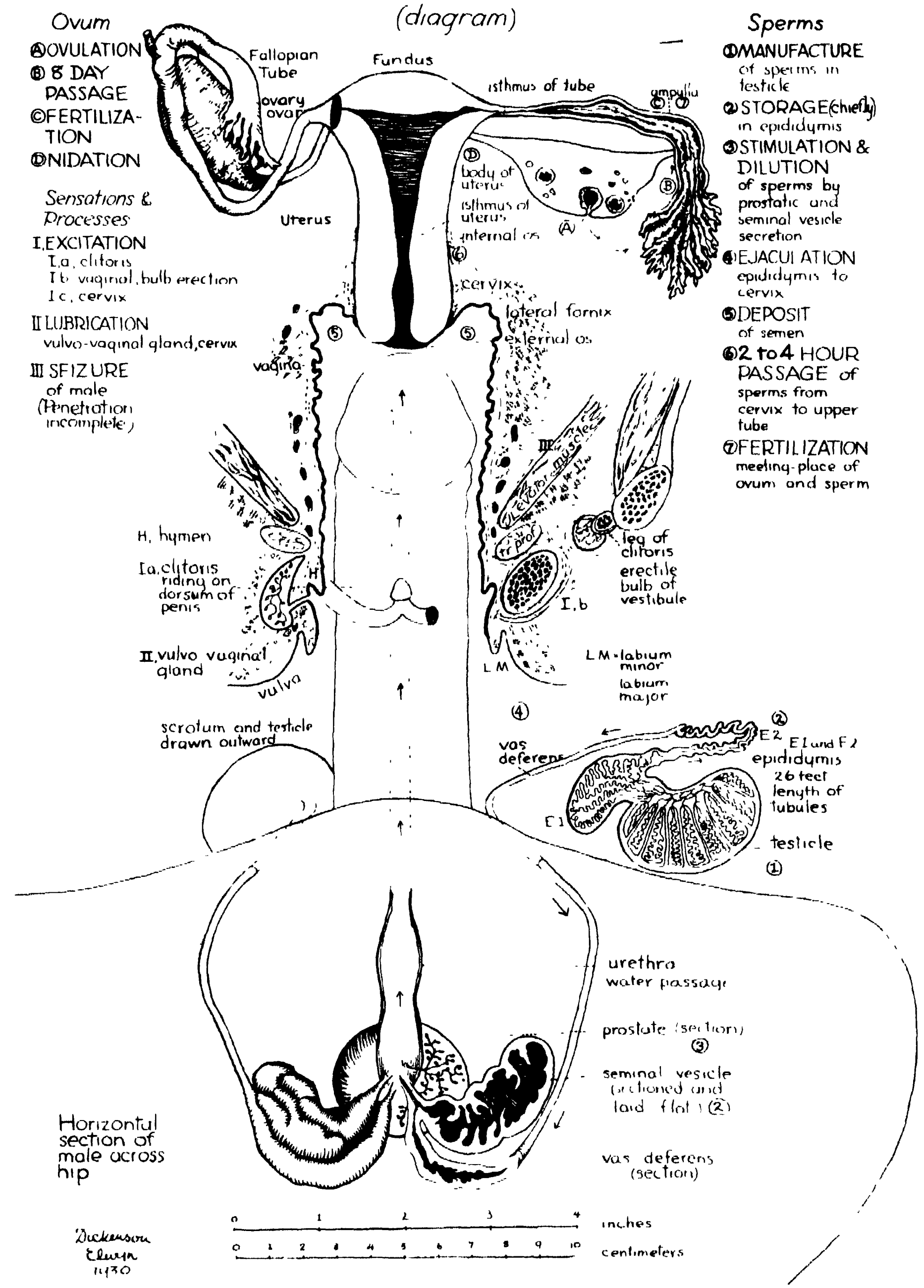


Fig. 68



Relation between Penis and Structures at Sides of Vagina

Fig. 69

CHAPTER V

THE VULVA AND BREAST

Text and commentary pages 40 to 70
Figures 70 to 104

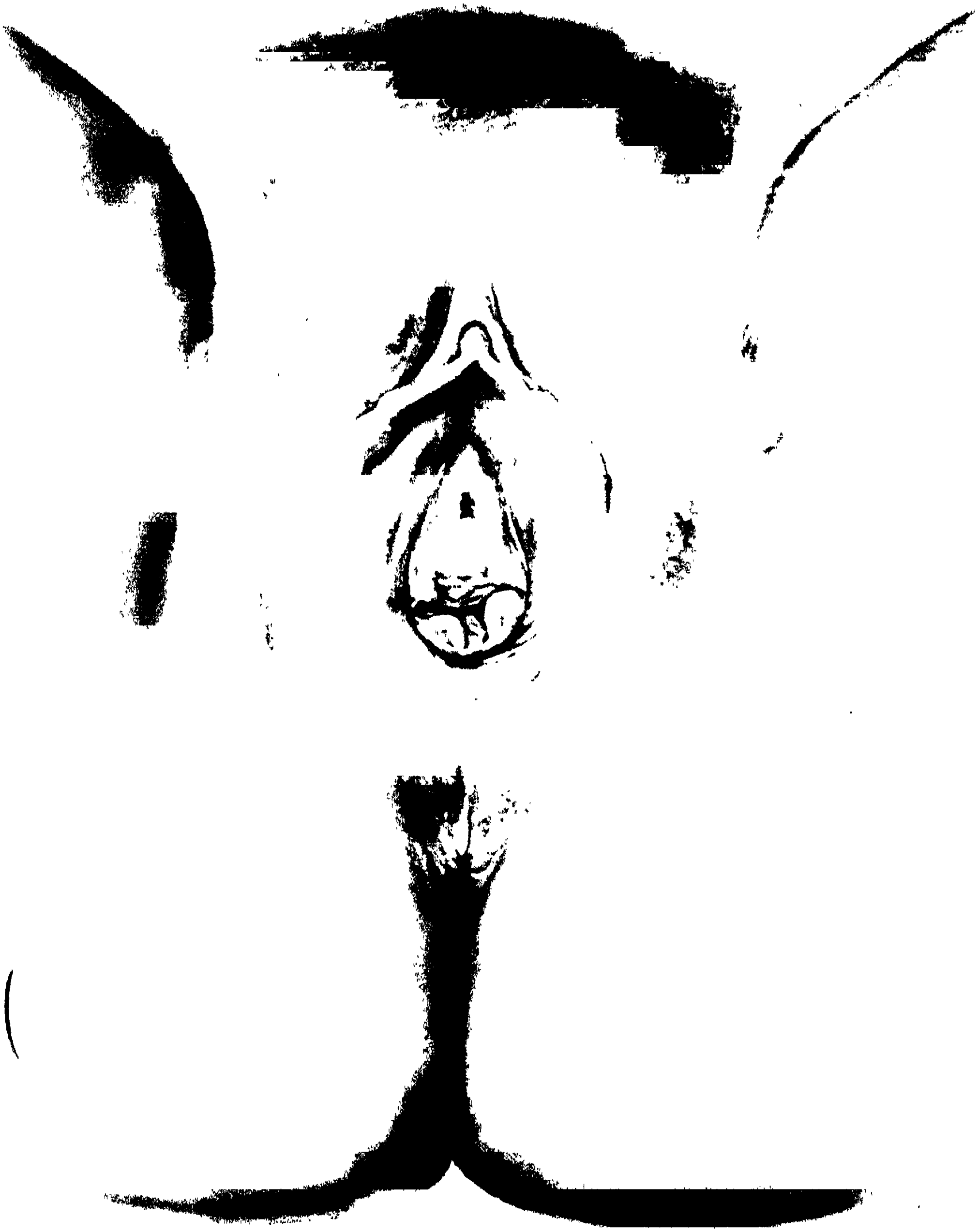
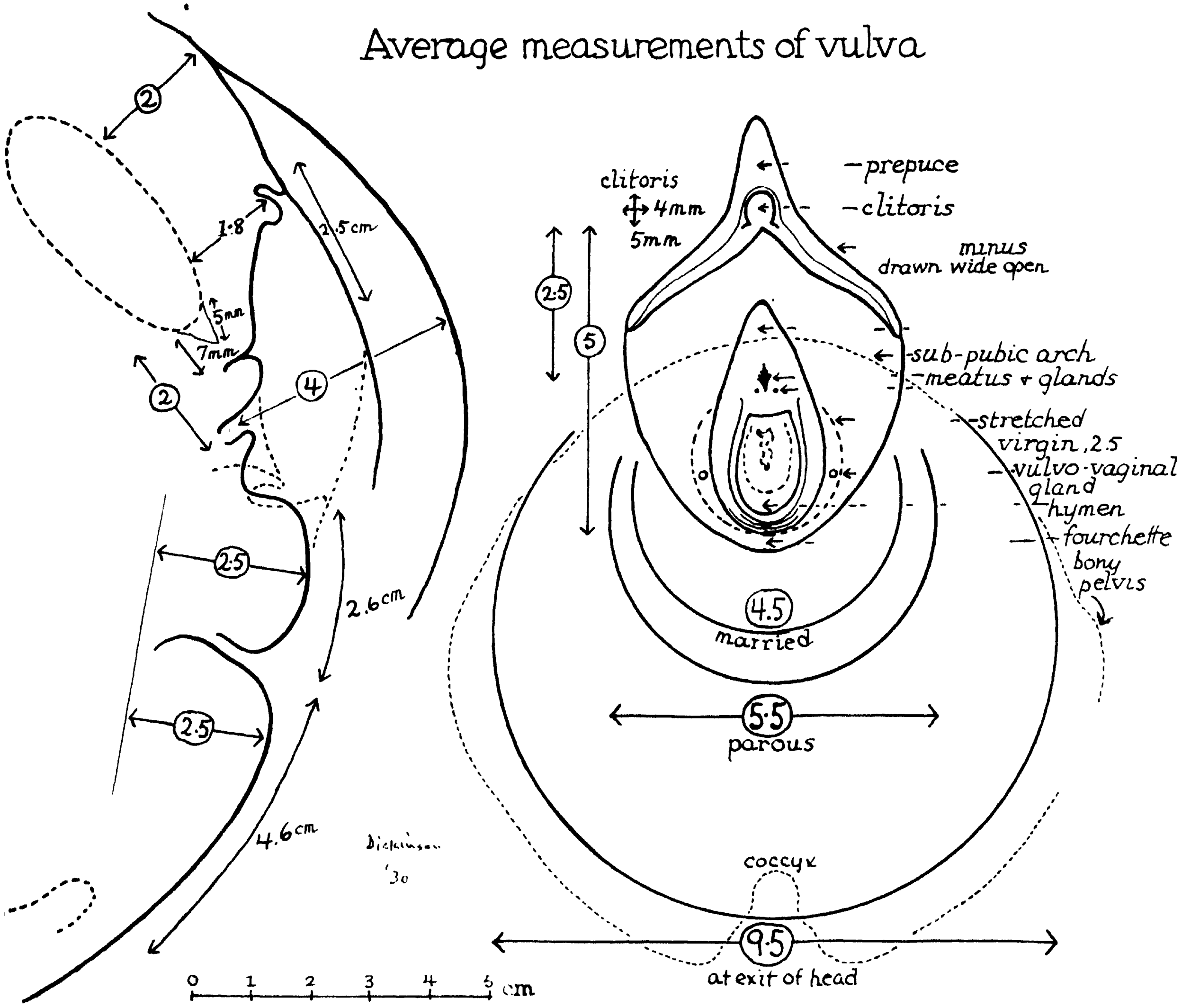
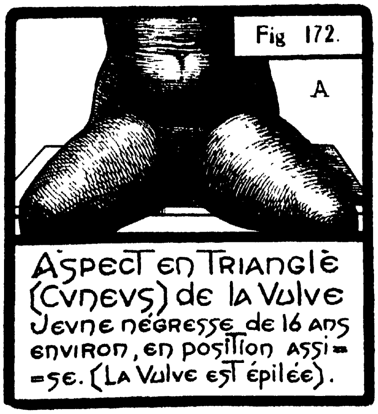


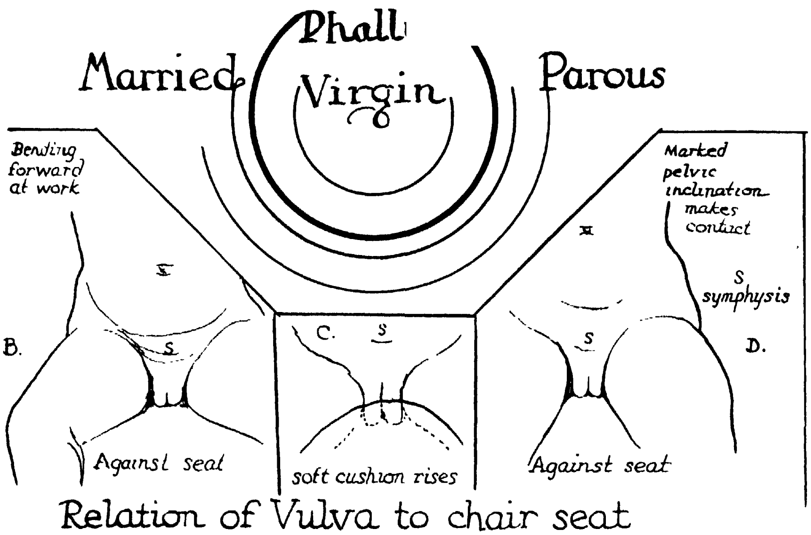
Fig. 72



Jayle, Gynecologie Morphologique

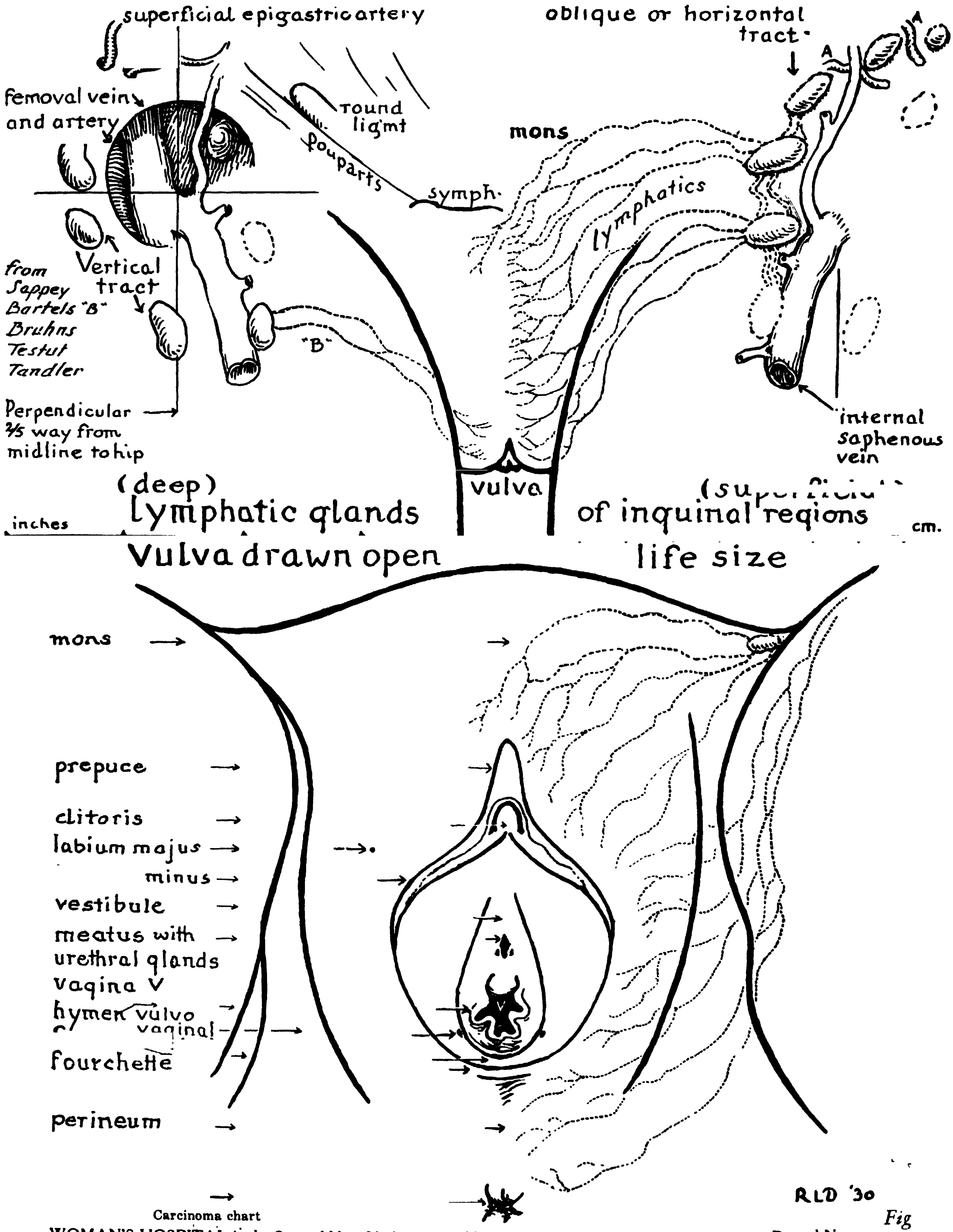


Aspect en Triangle (Cuneus) de la Vulve
Jeune négresse de 16 ans environ, en position assise. (La Vulve est épilée).



Relation of Vulva to chair seat

Fig. 73



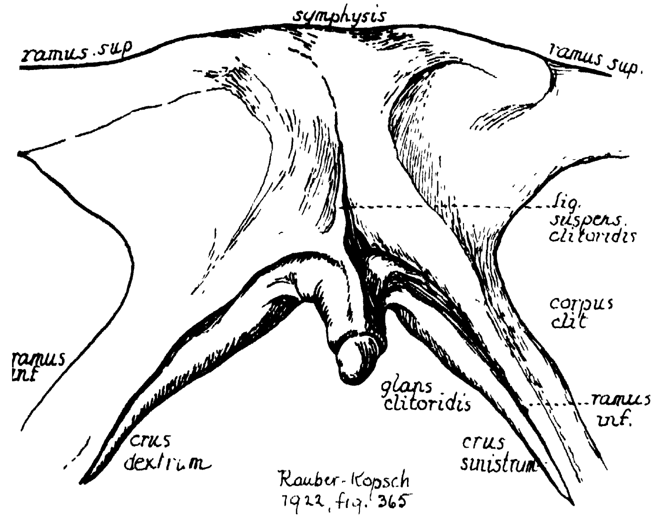
Carcinoma chart

WOMAN'S HOSPITAL in the State of New York

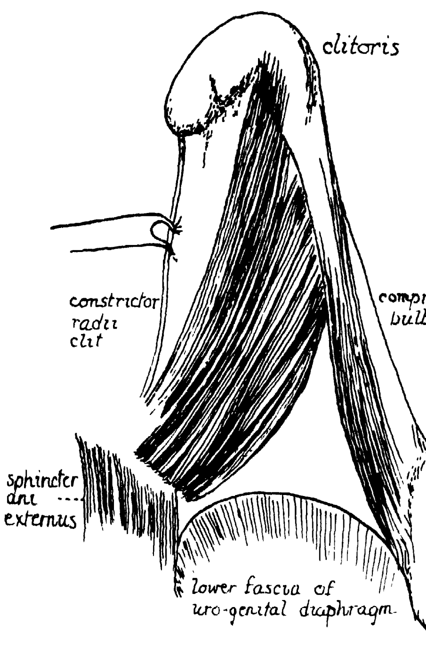
Name

Record No.

Fig



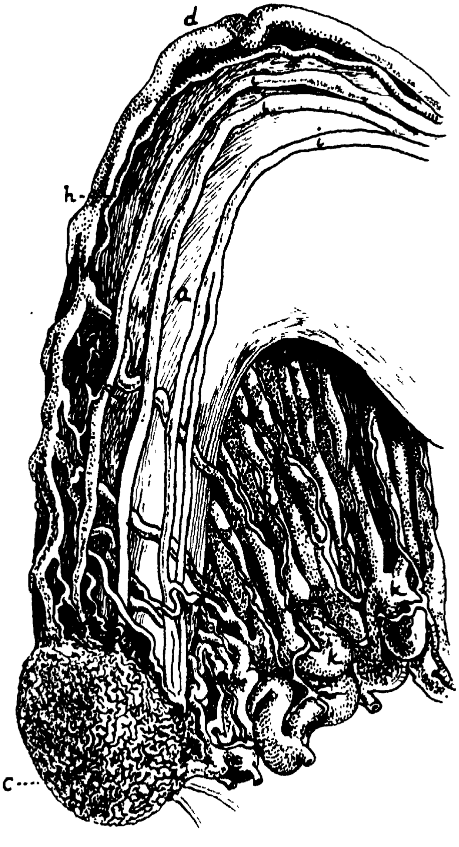
Rauber-Kopsch
1922, fig. 365



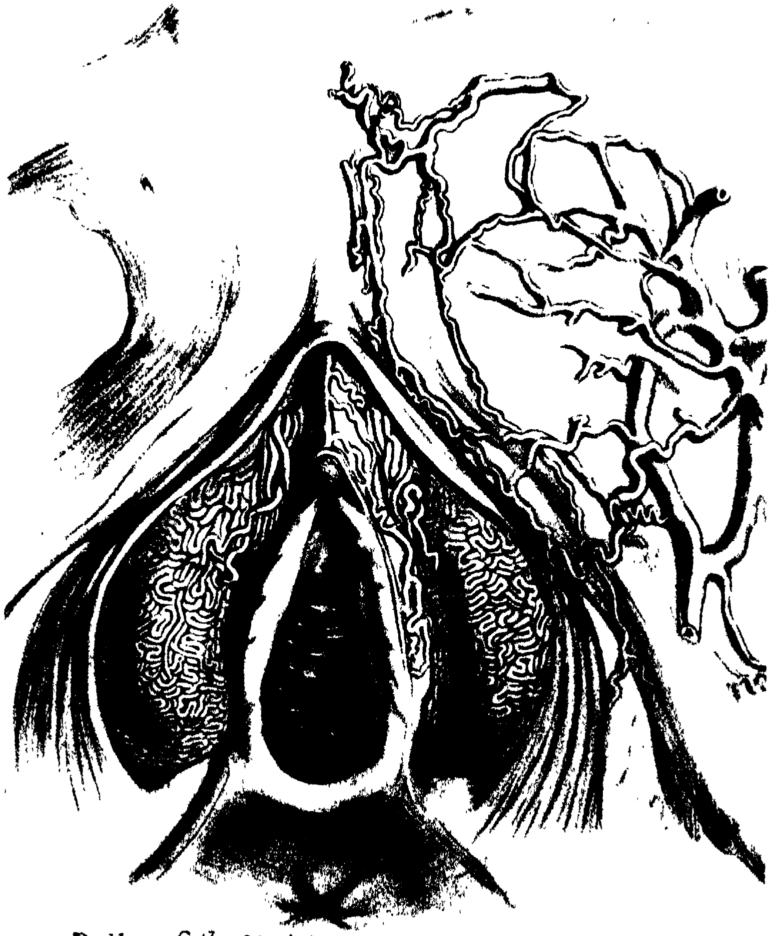
Holl in
Bardelebens
Anat.
7, 247

see male
Fig 121

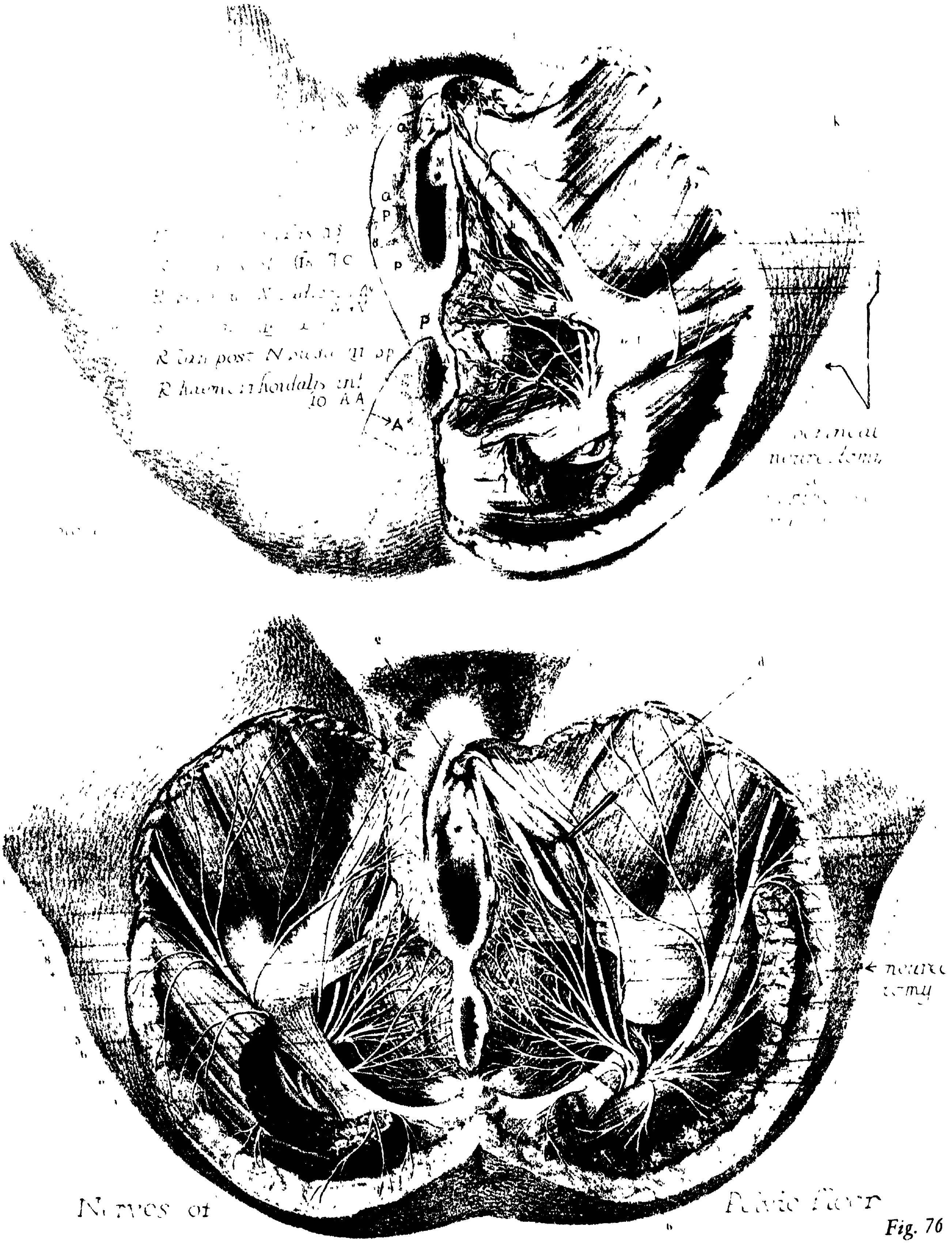
a. corpus clitoridis
c. glans clit.
d. vena dors. clit.
h. arteria dors. clit. (cut)
i·i·i· nervi dorsales
k·k pars intermedia



Kobelt

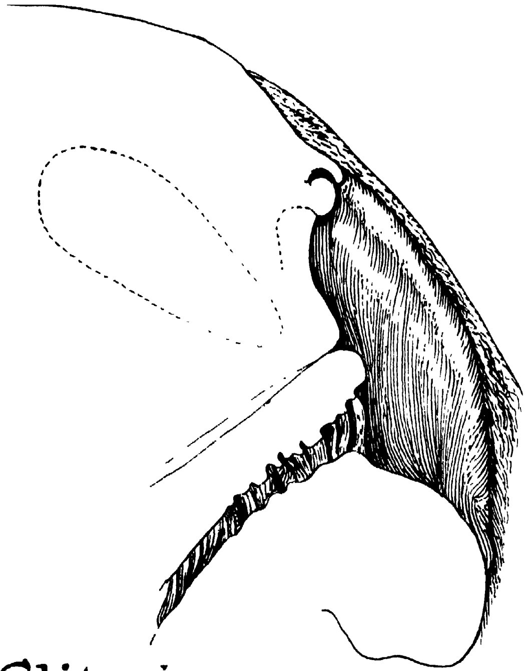


Bulbs of the Vestibule and vicinity

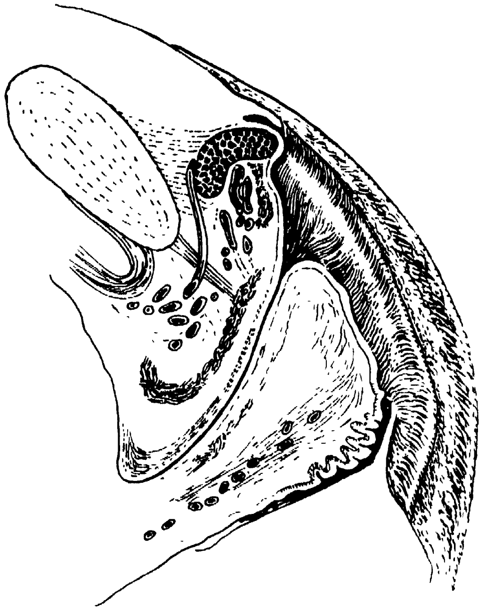


Nerves of Pelvic floor

Fig. 76



Clitoris; average location & projection

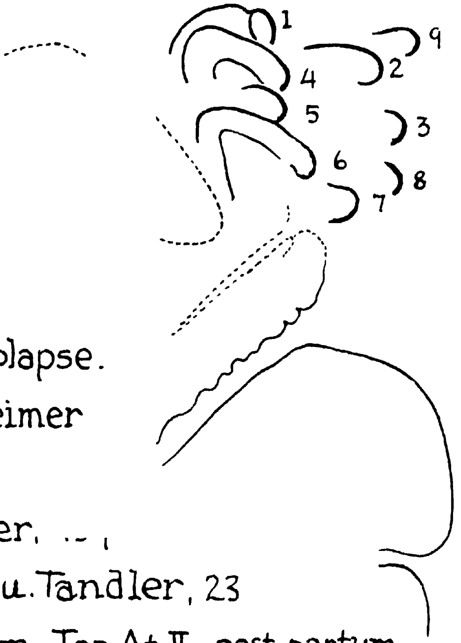


Testut & Jacob

(abnormal urethro-vaginal

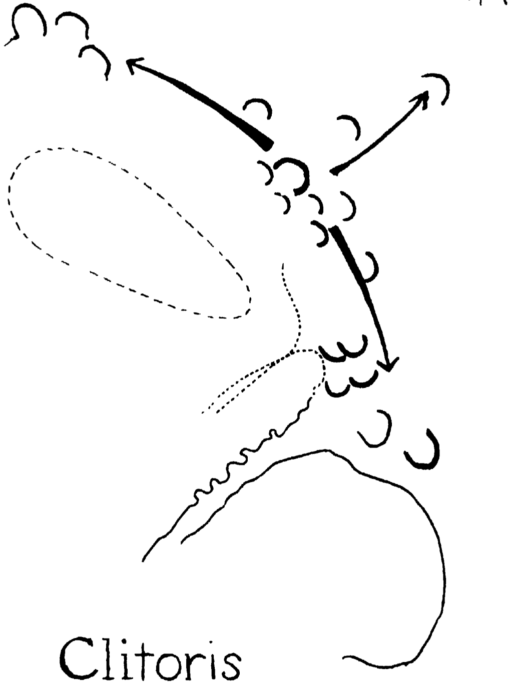
Dickinson 1929

Best examples in cadavers



1. Braune
2. H. & T. prolapse.
3. Eyclesheimer

5 Waldeyer,
6 Halban u. Tandler, 23
7. Sellheim Top. At. II., post partum
8 Liepmann
9. Winter. late pregnancy



Clitoris **Excursion** or Range with traction

Fig. 77

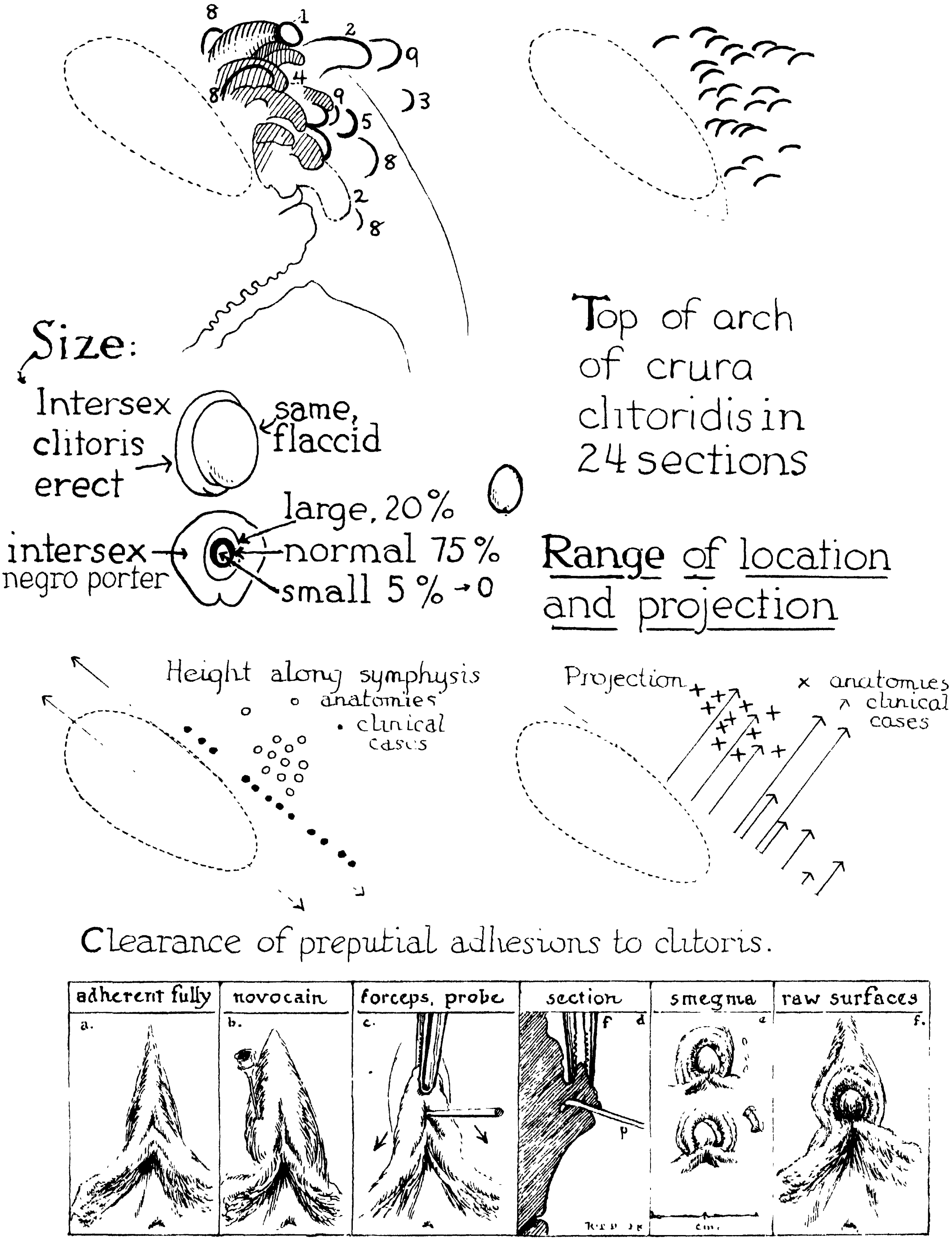

8
1
2
9
8
4
9
3
5
8
2
8
Top of arch of crura clitoridis in 24 sections
Size:
Intersex clitoris erect
same, flaccid
intersex negro porter
large, 20%
normal 75%
small 5% → 0
Range of location and projection
Height along symphysis
o anatomies
• clinical cases
Projection
× anatomies
↗ clinical cases
Clearance of preputial adhesions to clitoris.
adherent fully
novocain
forceps, probe
section
smegma
raw surfaces
a.
b.
c.
f
d
p
e
f.
cm.

Fig. 77a

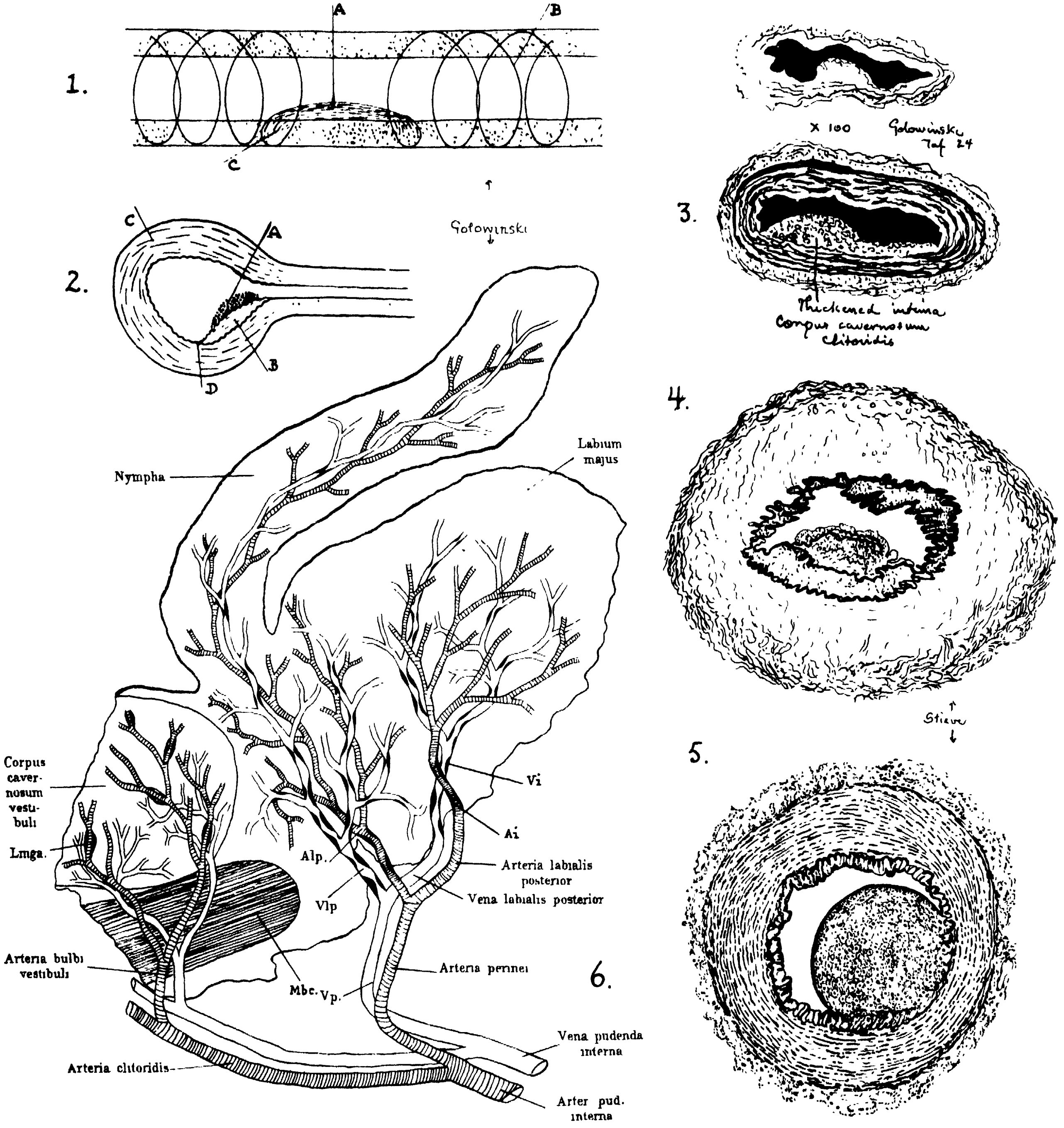

1.
A
B
C
Golowinski
2.
C
A
B
D
X 100
Golowinski Taf 24
3.
Thickened intima
Corpus cavernosum clitoridis
4.
Stieve
5.
6.
Nympha
Labium majus
Corpus cavernosum vestibuli
Lmga.
Vi
Ai
Alp.
Arteria labialis posterior
Vlp
Vena labialis posterior
Arteria bulbi vestibuli
Arteria perinei
Mbc.
Vp.
Vena pudenda interna
Arteria clitoridis
Arter pud. interna

Fig. 77b

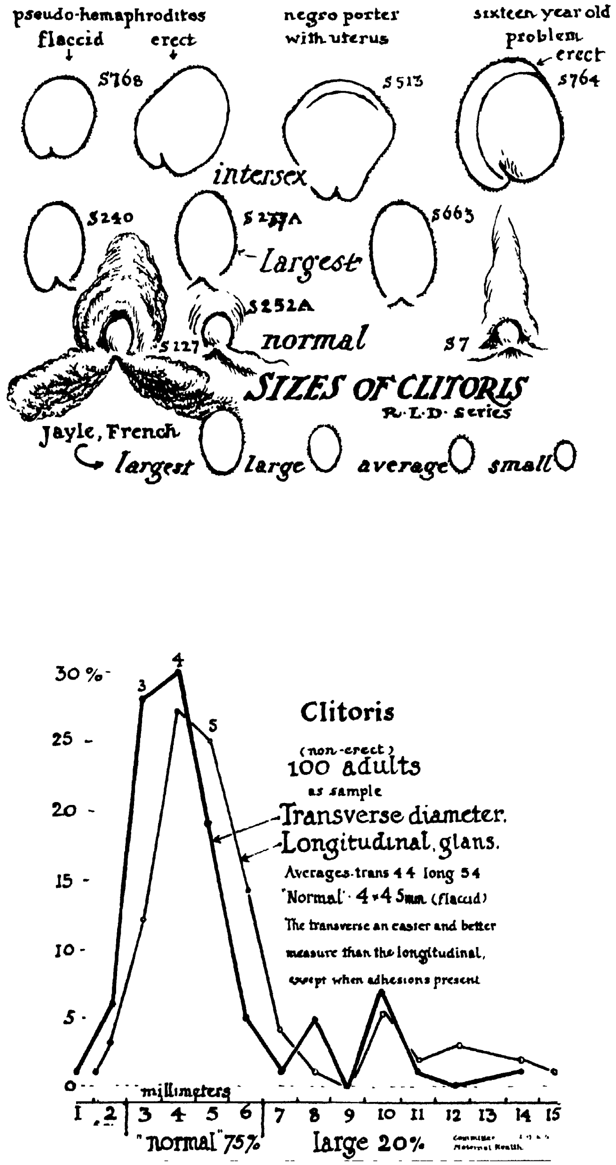
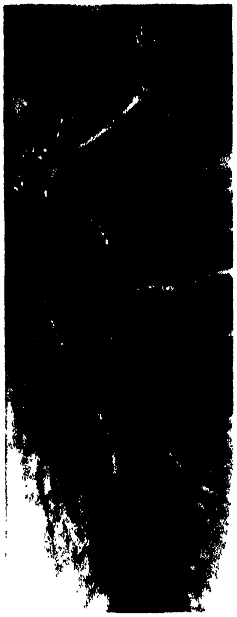
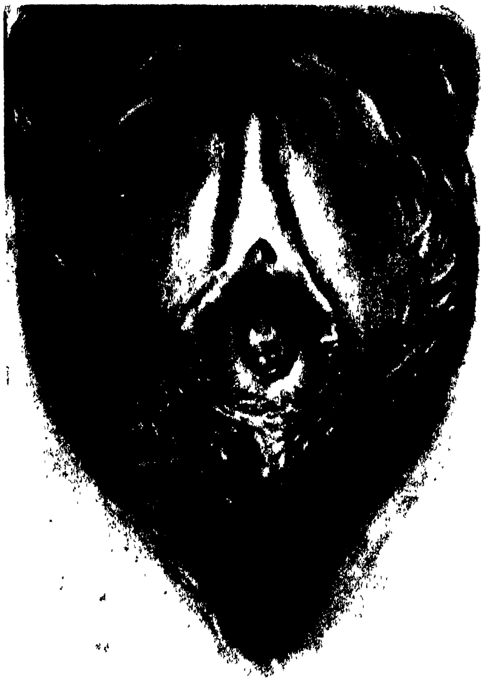
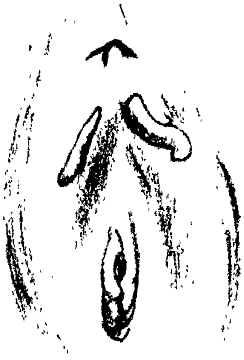

pseudo-hemaphrodites
flaccid
erect
S768
negro porter
with uterus
S513
sixteen year old
problem
erect
S764
intersex
S240
S277A
largest
S663
S252A
normal
S127
S7
SIZES OF CLITORIS
R·L·D· series
Jayle, French
largest
large
average
small
30 %
25
20
15
10
5
0
3
4
5
Clitoris
(non-erect)
100 adults
as sample
Transverse diameter.
Longitudinal, glans.
Averages-trans 4 4 long 5 4
"Normal" · 4 x 4 5mm (flaccid)
The transverse an easier and better
measure than the longitudinal,
except when adhesions present
millimeters
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
"normal" 75%
large 20%
Committee
Maternal Health

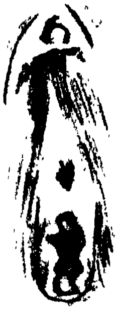
Fig 77c



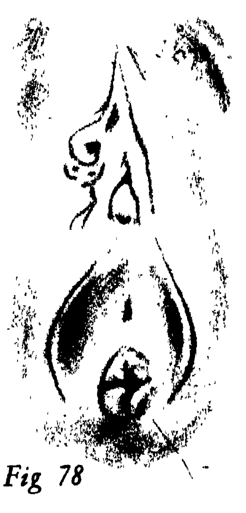
Virgin with typical
bow shape labia
S128, like S41

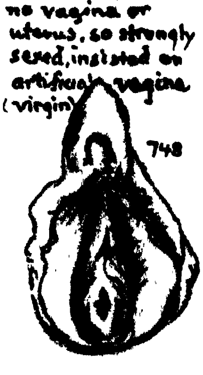




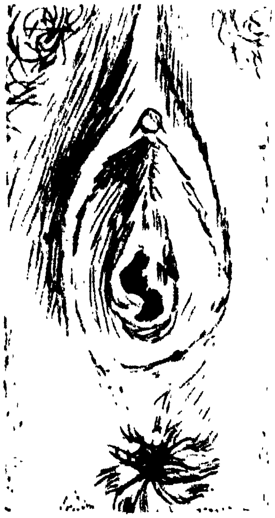


S447 at 39:
married and
frigid.
S751 scant prepuce
and Labia, frigid.
S679 32, married.
S748, at 37, with
no vagina or
uterus, so strongly
sexed, insisted on
artificial vagina
(virgin)

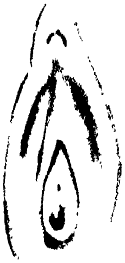




748



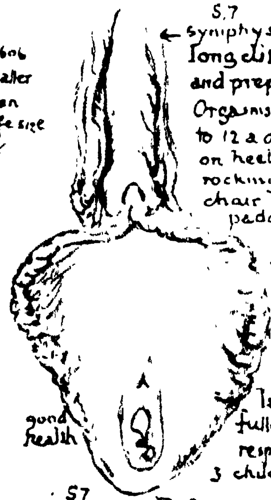
S59, at 22 years:
from 12 to 18, daily
frequently digital
vaginal orgasm:
virgin



S606
smaller
than
life size

From 12 to 18
quick orgasms
from thigh
compressions;
feasible with
others present

All lifesize,
(save 606)
lifted out
of case
records

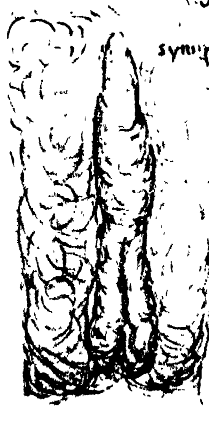


S,7
symphysis
long clitoris
and prepuce
Orgasms up
to 12 a day
on heel in
rocking
chair or
padded
in
bed:

good
health

later
fullest
responses
3 children

S7



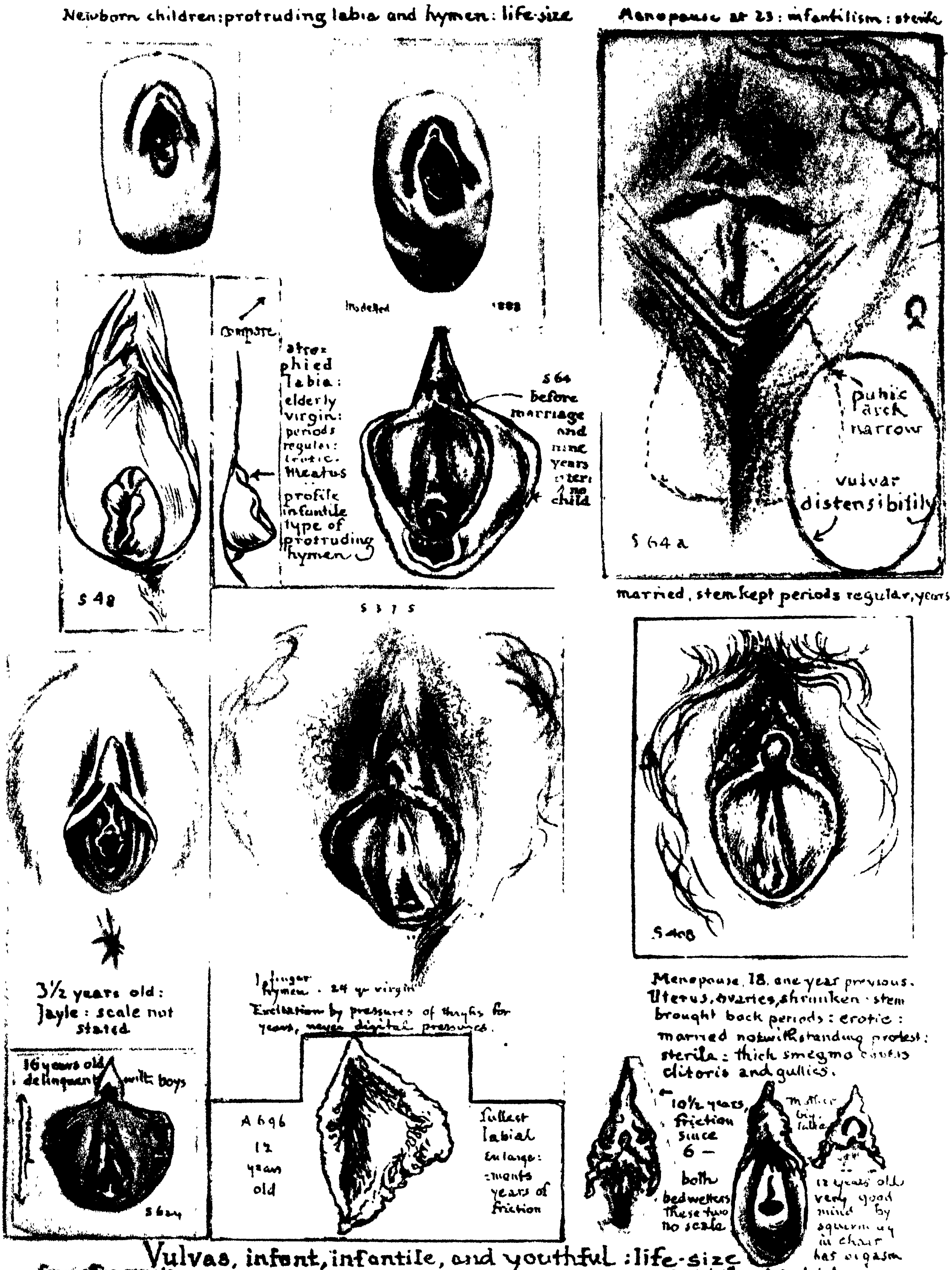
Standing
symphysis

S297
another
heel
orgasm
of
many
years
standing
needed
perineal
neurectomy
with
success

Marked sex torment for years
in 128, 151, 41, 606, 59, and 748
Early kraurosis in 151, watched
from birth to 38 (1 child) control
by phenol. At 70 minora may
disappear, from atrophy

Small and defective
Labia Minora

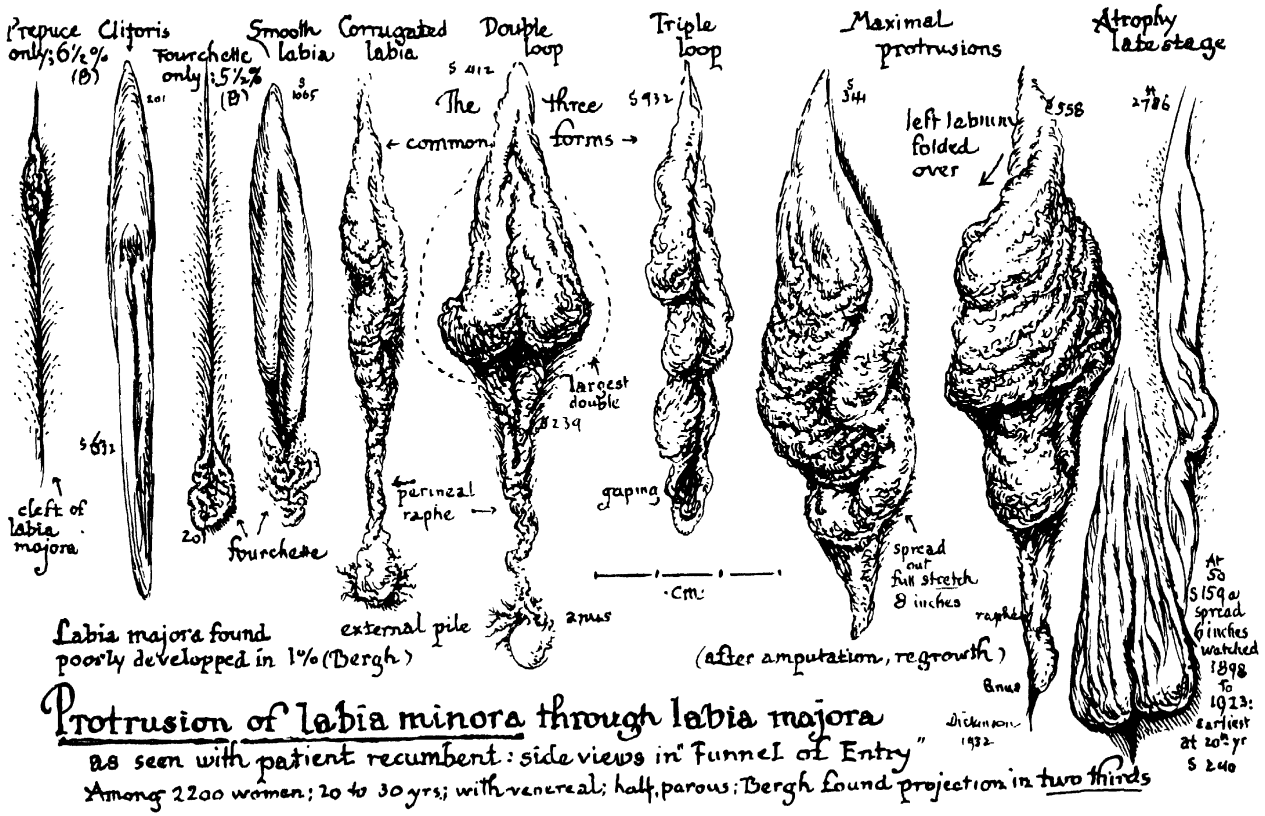
Fig 78


Newborn children: protruding labia and hymen: life-size
Menopause at 23: infantilism: sterile
modelled
1883
compare
atrophied labia: elderly virgin: periods regular: erotic. Meatus
profile infantile type of protruding hymen
S 64 before marriage and nine years after no child
S 48
pubic arch narrow
vulvar distensibility
S 64 a
married, stem kept periods regular, years
S 3 7 5
S 408
3½ years old: Jayle: scale not stated
1 finger hymen . 24 yr virgin
Excitation by pressures of thighs for years, never digital pressures.
Menopause, 18, one year previous. Uterus, ovaries, shrunken · stem brought back periods: erotic: married notwithstanding protest: sterile: thick smegma covers clitoris and gullies.
16 years old delinquent with boys
S 624
A 696
12 years old
fullest labial enlargements years of friction
10½ years, friction since 6 —
both bedwetters these two no scale
mother big labia
12 years old very good mind by squirming in chair has orgasm

Vulvas, infant, infantile, and youthful: life-size
except otherwise stated

From office records

Fig. 79


Prepuce Clitoris only; 6½% (B)
201
Fourchette only; 5½% (B)
Smooth labia
S 1065
Corrugated labia
Double loop
S 412
The three common forms
Triple loop
S 932
Maximal protrusions
S 341
left labium folded over
S 558
Atrophy late stage
2786
S 631
cleft of labia majora
201
fourchette
perineal raphe
largest double
S 239
external pile
anus
gaping
cm
spread out full stretch 8 inches
raphe
anus
Dickinson 1932
At 50 S 159a spread 6 inches watched 1898 to 1923: earliest at 20th yr S 240
Labia majora found poorly developped in 1% (Bergh)
(after amputation, regrowth)
Protrusion of labia minora through labia majora
as seen with patient recumbent: side views in "Funnel of Entry"
Among 2200 women; 20 to 30 yrs; with venereal; half parous; Bergh found projection in two thirds

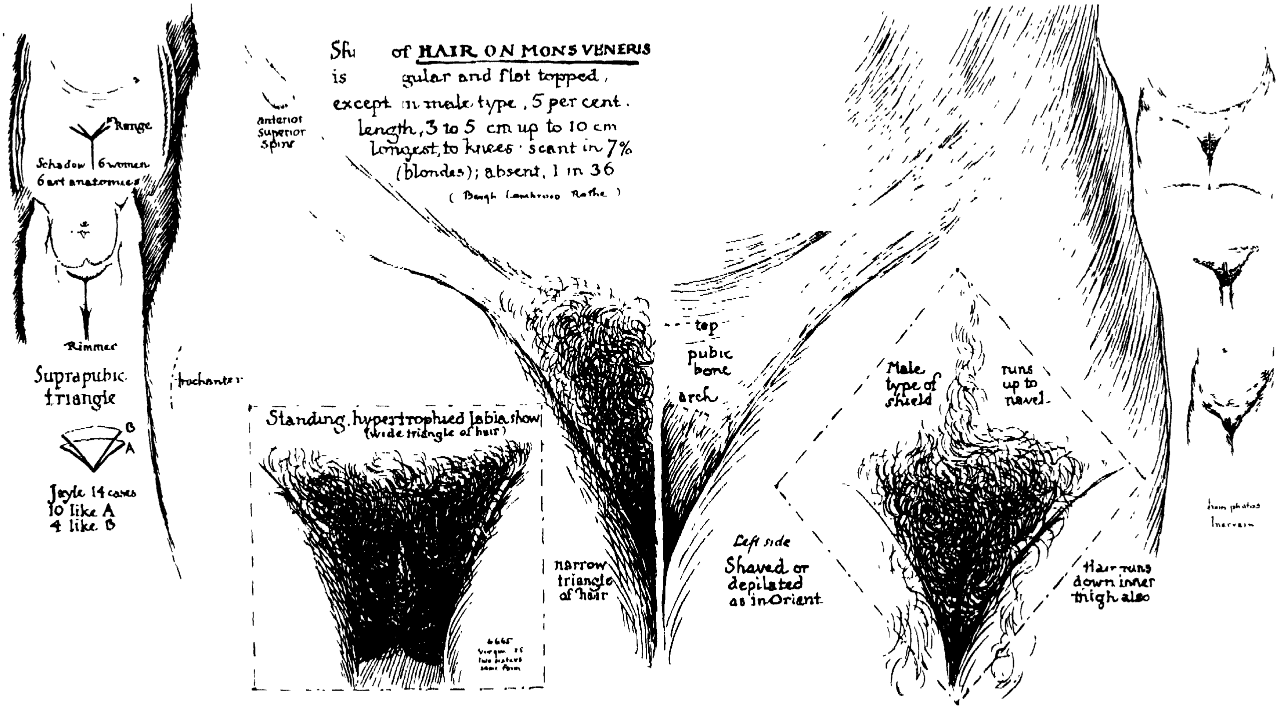
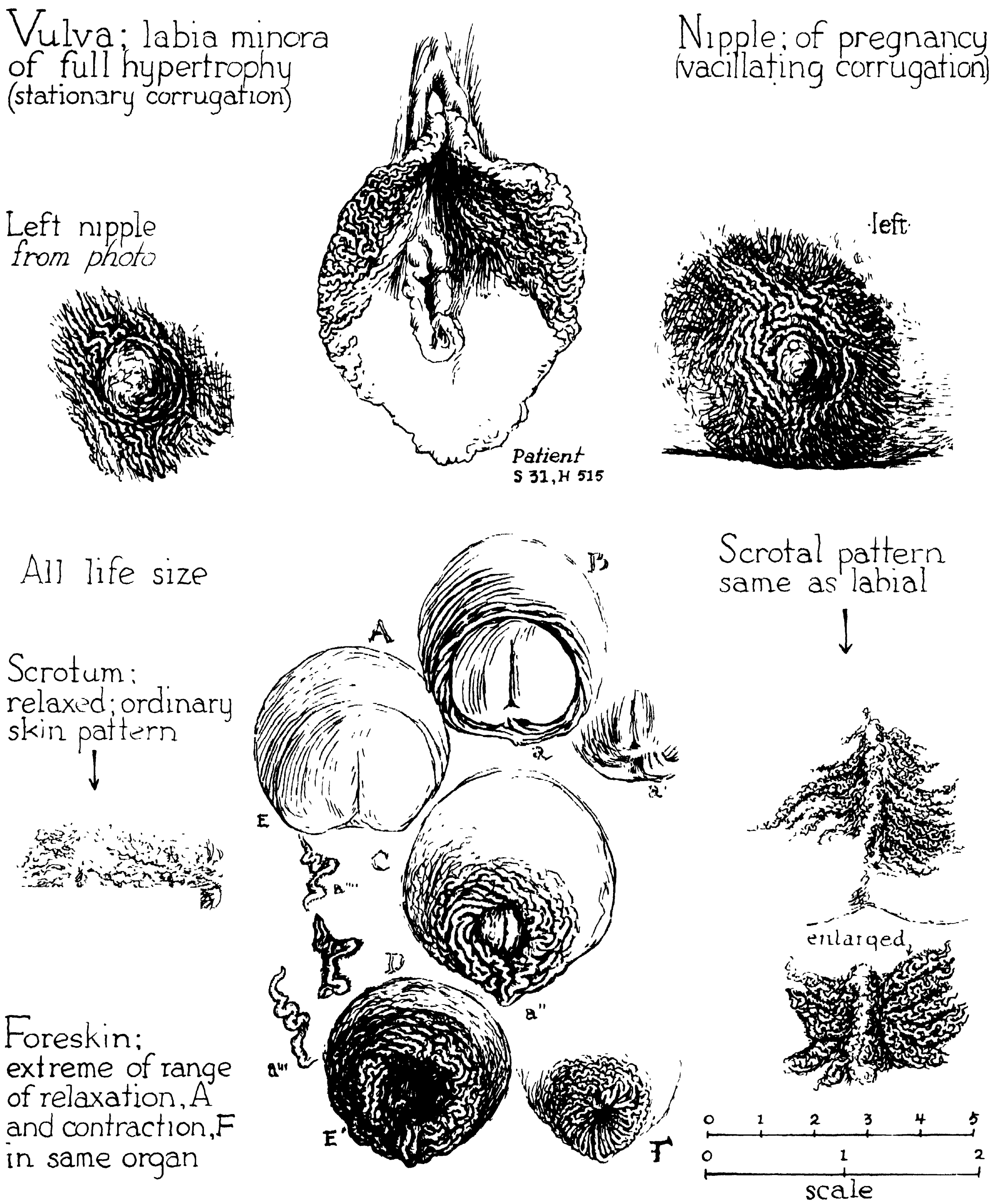

Range
Schadow 6 women
6 art anatomies
Rimmer
Suprapubic triangle
B
A
Jeyle 14 cases
10 like A
4 like B
anterior superior spine
trochanter
Sh of HAIR ON MONS VENERIS
is gular and flat topped,
except in male type, 5 per cent.
length, 3 to 5 cm up to 10 cm
longest, to knees · scant in 7%
(blondes); absent, 1 in 36
(Bergh Lombroso Rothe)
top pubic bone
arch
Standing, hypertrophied labia show (wide triangle of hair)
4665
Virgin 25
two sisters
same form
narrow triangle of hair
Male type of shield
runs up to navel
Left side
Shaved or depilated as in Orient
Hair runs down inner thigh also
from photos
Inervain

Fig. 80


Vulva; labia minora of full hypertrophy (stationary corrugation)
Nipple; of pregnancy (vacillating corrugation)
Left nipple from photo
·left·
Patient S 31, H 515
All life size
Scrotal pattern same as labial
Scrotum: relaxed; ordinary skin pattern
A
B
C
D
E
E'
F
a
a'
a''
a'''
a''''
enlarged
Foreskin; extreme of range of relaxation, A and contraction, F in same organ
0 1 2 3 4 5
0 1 2
scale

Various Corrugations
but the pattern of the puckers is the same

Fig. 81

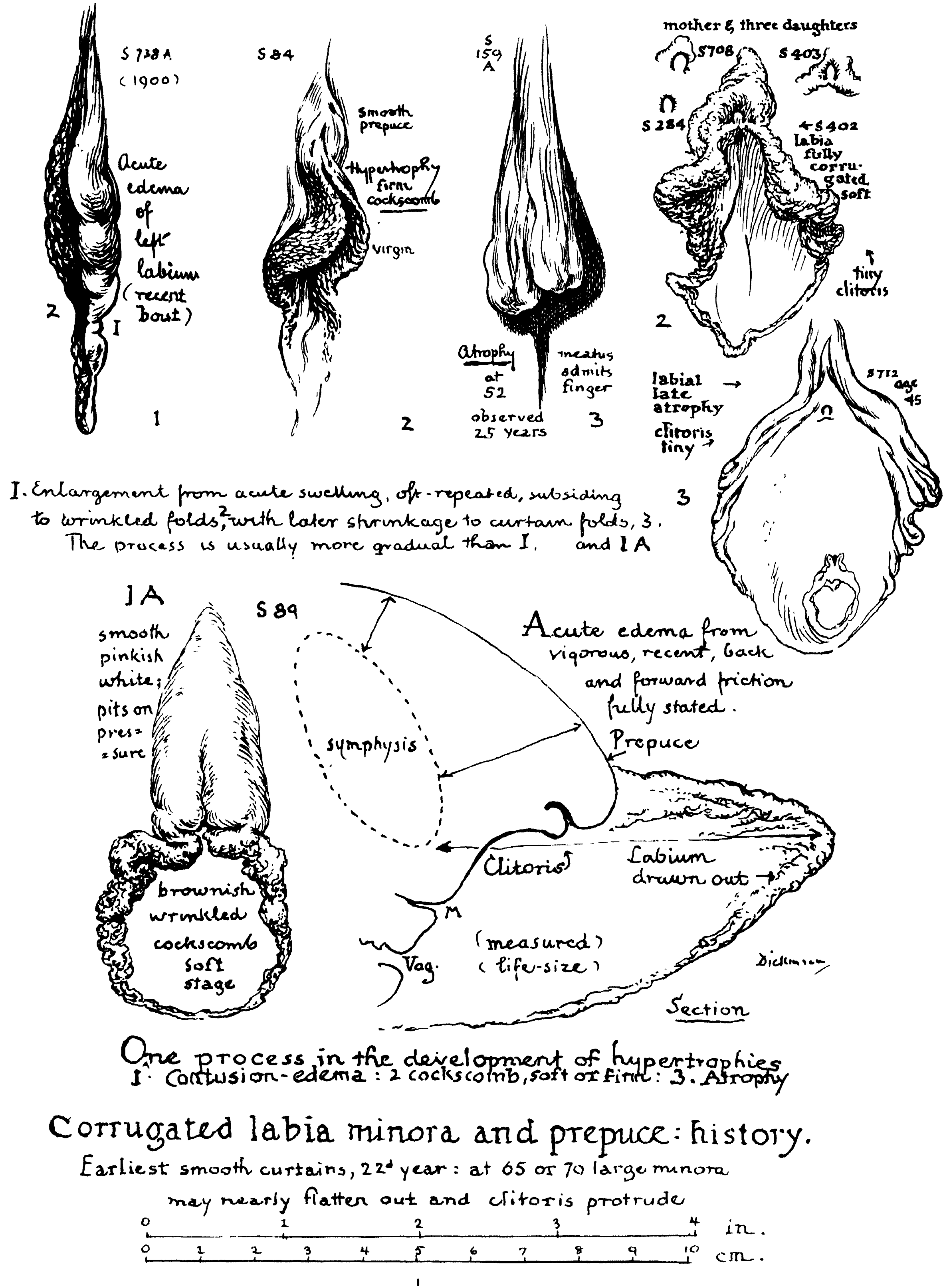
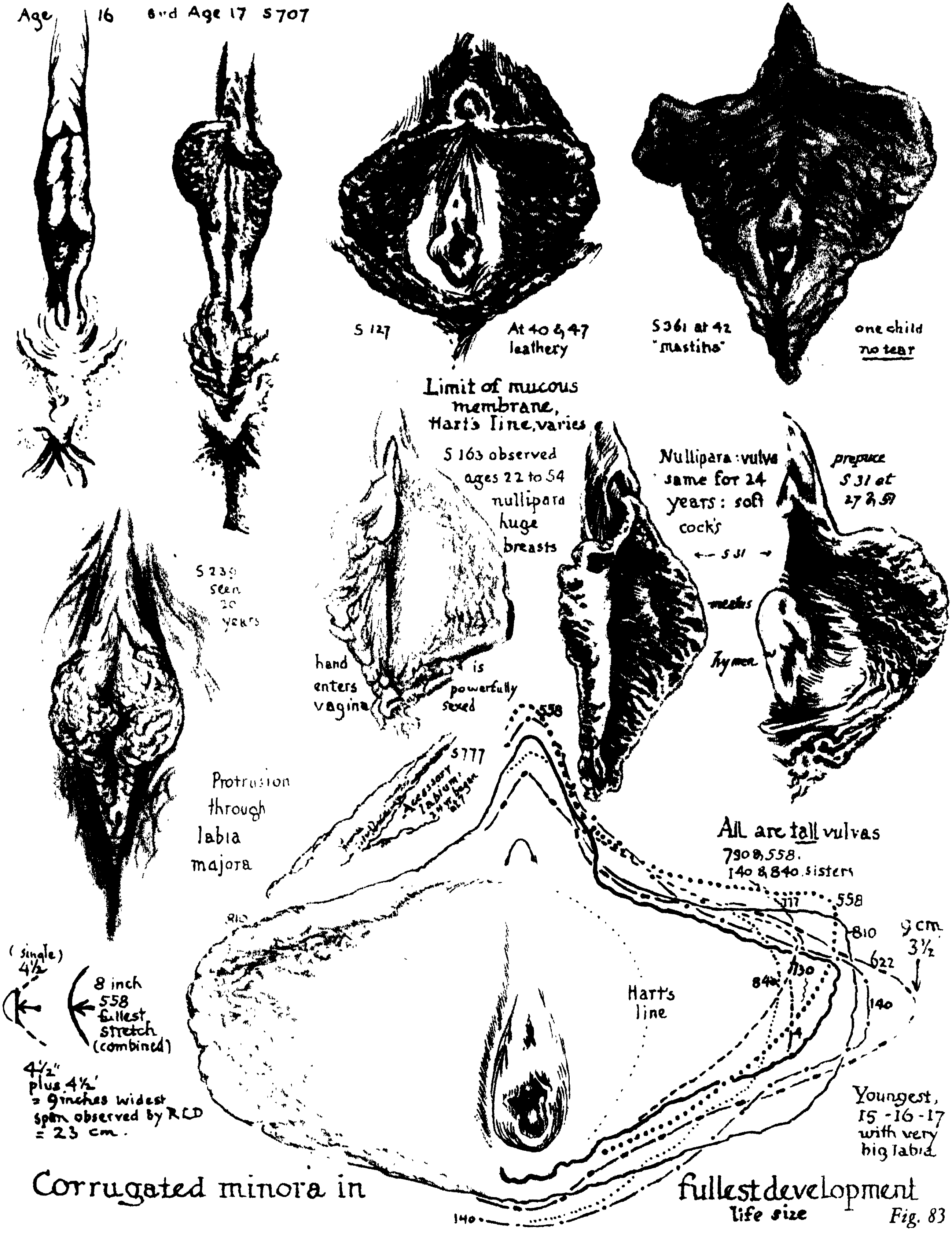
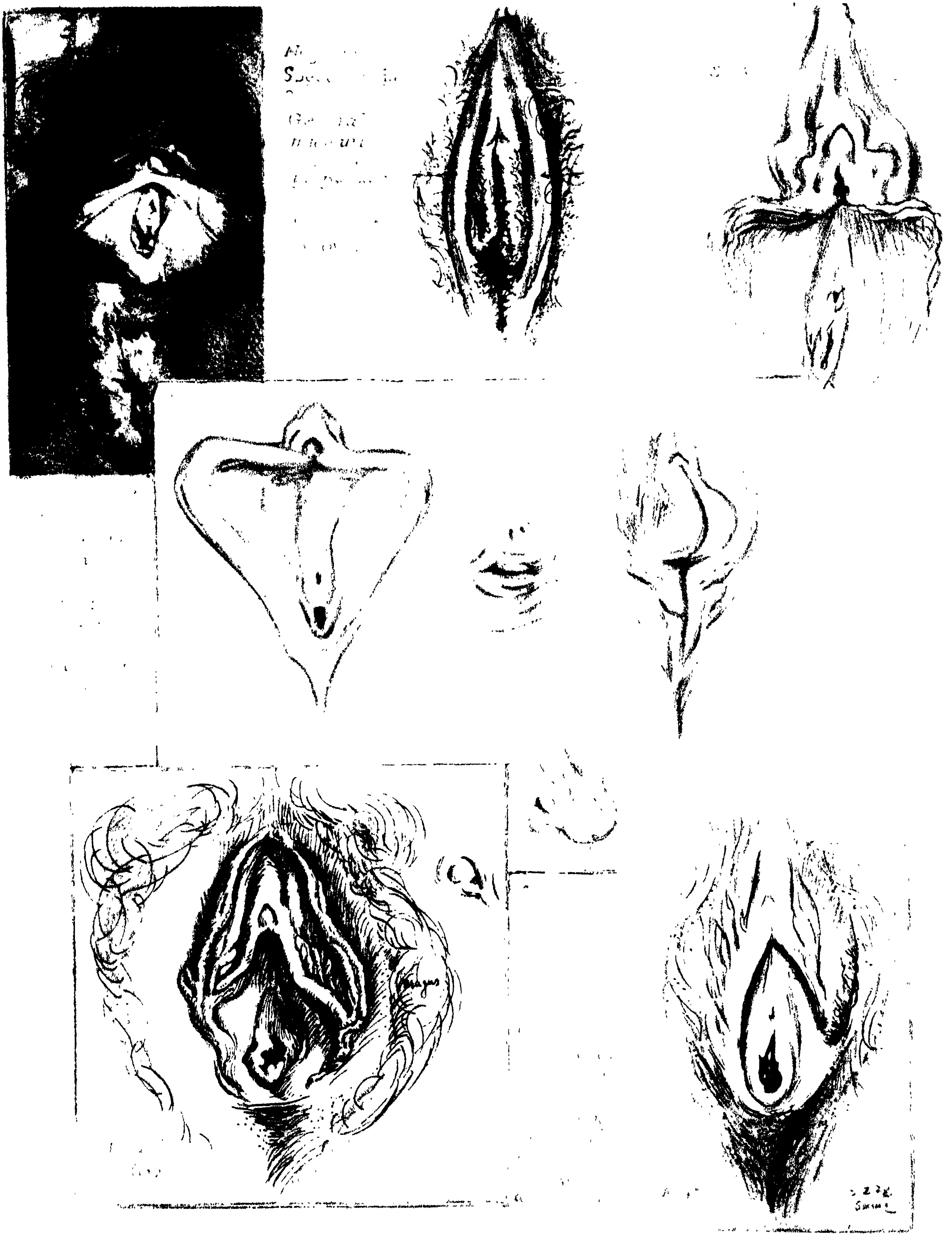

S 738 A
(1900)
Acute edema of left labium (recent bout)
2
I
1
S 84
Smooth prepuce
Hypertrophy firm cockscomb
virgin
2
S 159 A
Atrophy at 52
meatus admits finger
observed 25 years
3
mother & three daughters
S 708
S 403
S 284
S 402
labia fully corrugated soft
tiny clitoris
2
labial late atrophy
clitoris tiny
S 712 age 45
3
I. Enlargement from acute swelling, oft-repeated, subsiding to wrinkled folds, 2 with later shrinkage to curtain folds, 3.
The process is usually more gradual than I. and I A
I A
smooth pinkish white; pits on pressure
brownish wrinkled cockscomb soft stage
S 89
symphysis
Acute edema from vigorous, recent, back and forward friction fully stated.
Prepuce
Clitoris
Labium drawn out
M
Vag.
(measured) (life-size)
Section
Dickinson
One process in the development of hypertrophies
I. Contusion-edema : 2 cockscomb, soft or firm : 3. Atrophy
Corrugated labia minora and prepuce: history.
Earliest smooth curtains, 22d year: at 65 or 70 large minora may nearly flatten out and clitoris protrude
0 1 2 3 4 in.
0 1 2 3 4 5 6 7 8 9 10 cm.

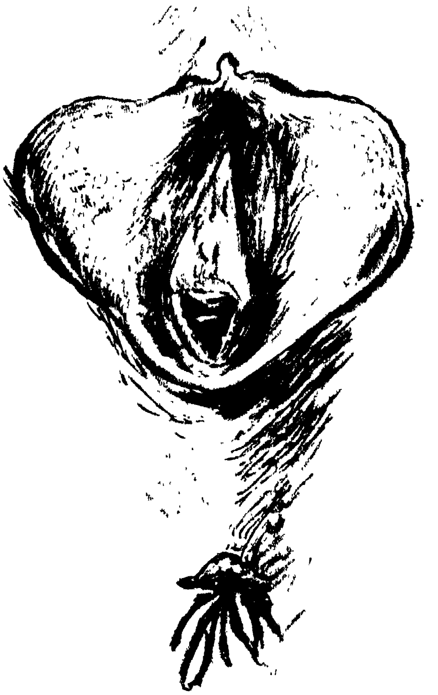
Fig. 82



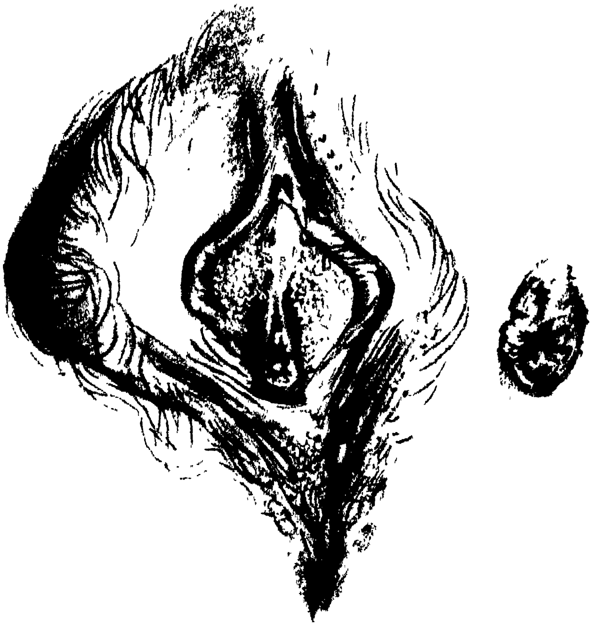
Corrugated minora in fullest development
life size

Fig. 83

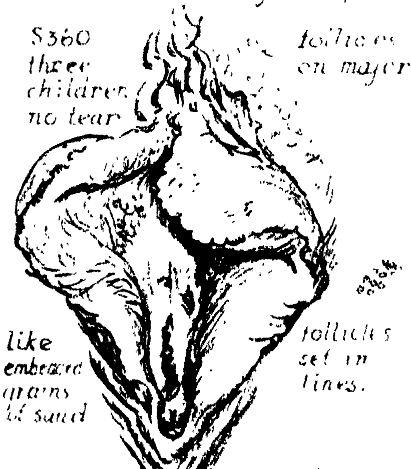




S.746 48 yr. Prepuce absent, follicles everywhere, [illegible]



S326 Virgin of 45; close set follicles fimbriae [illegible]

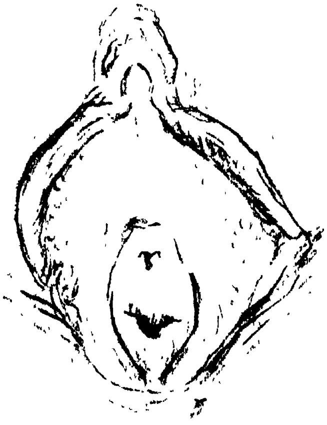


S360 three children no tear

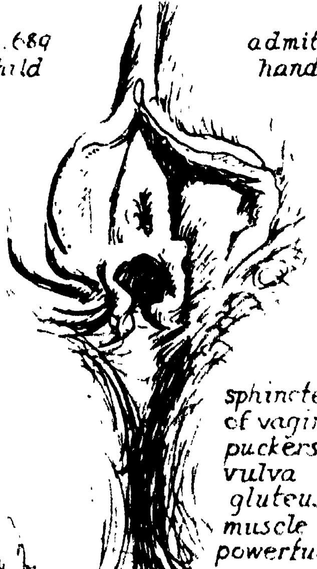
follicles on majora

like embedded grains of sand

follicles set in lines.



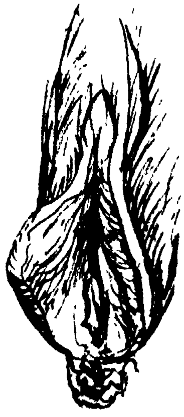
S.141 Executive, Virgin pressure begun at eight as no short stroke.



S.689 1 child

admits hand

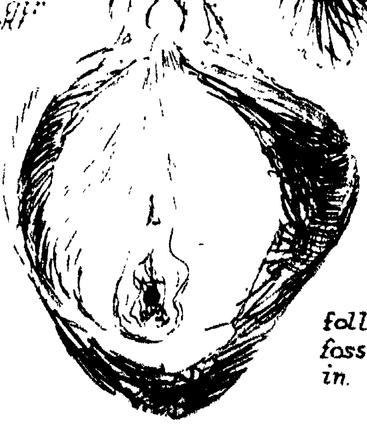
sphincter of vagina puckers vulva gluteus muscle powerful.



S.105 at 37 projection through labia majora thick firm.

Sebaceous Glands (follicles) of labia

Smooth, thick, firm (brawny) forms of labia



same S.105 at 27 excursion of clitoris 2 inches

follicles in fossa navicularis in S.3133.

Fig. 85

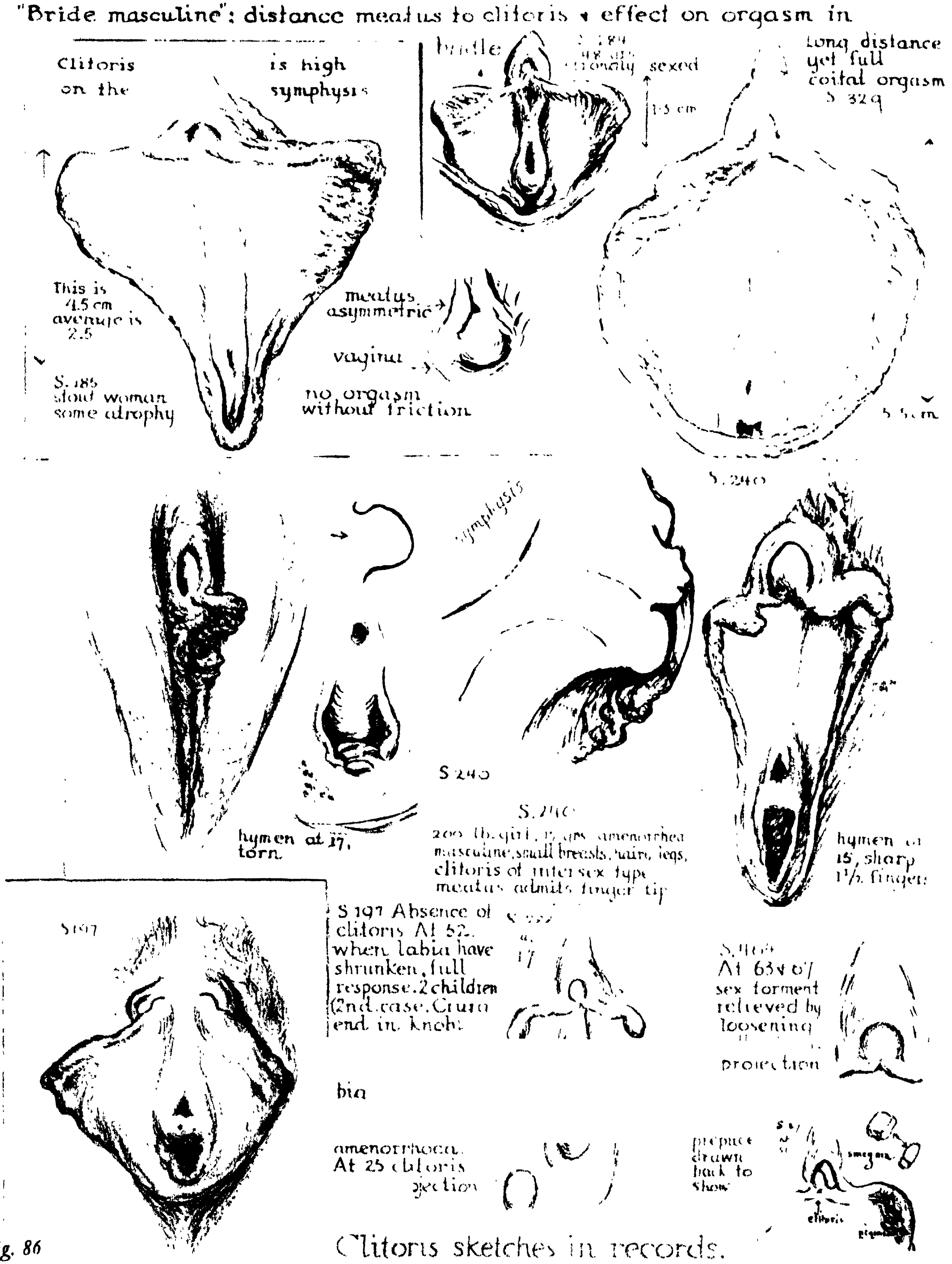
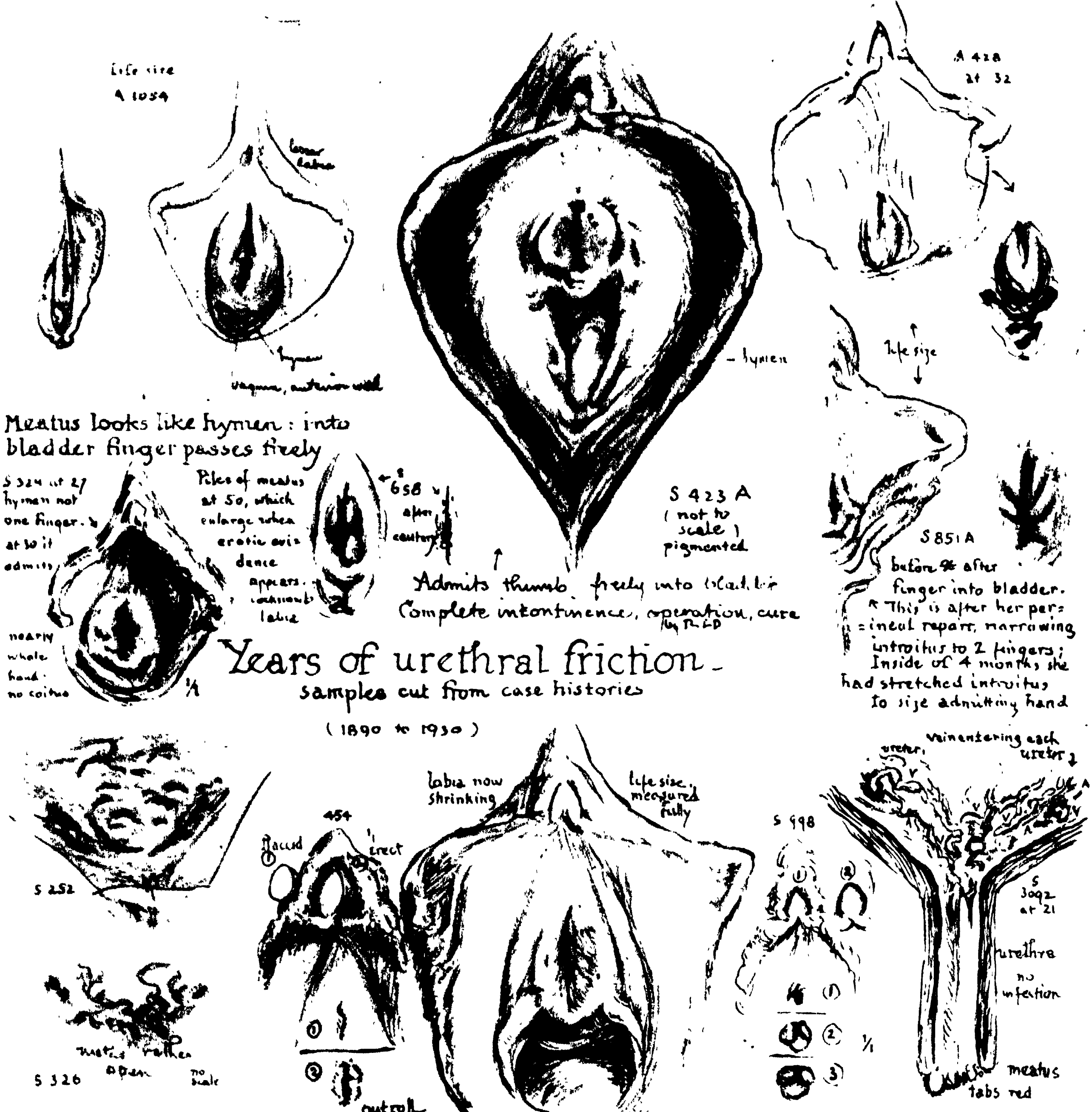

"Bride masculine": distance meatus to clitoris + effect on orgasm in
Clitoris is high on the symphysis
This is 4.5 cm average is 2.5
S. 186 stout woman some atrophy
bridle
S. 184 48 yrs strongly sexed
1.5 cm
meatus asymmetric
vagina
no orgasm without friction
Long distance yet full coital orgasm S 329
5.5 cm
S. 240
symphysis
hymen at 17, torn.
S 240
S. 240
200 lb. girl, 17 yrs amenorrhea masculine, small breasts, hairy legs, clitoris of intersex type meatus admits finger tip
hymen at 15, sharp 1½ fingers
S 197
S 197 Absence of clitoris At 52, when labia have shrunken, full response. 2 children (2nd. case. Crura end in knob.
17
S. 464 At 63 + 67 sex torment relieved by loosening projection
bia
amenorrhoea. At 25 clitoris jection
prepuce drawn back to show
smegma
clitoris

Fig. 86 Clitoris sketches in records.

Years of urethral friction -

samples cut from case histories

(1890 to 1930)



Meatus looks like hymen : into bladder finger passes freely

S 324 at 27 hymen not one finger. & at 30 it admits

Piles of meatus at 50, which enlarge when erotic evidence appears. continuous labia

Admits thumb freely into bladder
Complete incontinence, operation, cure by R.L.D

before & after finger into bladder.
* This is after her perineal repair, narrowing introitus to 2 fingers; Inside of 4 months she had stretched introitus to size admitting hand

S 252 Venous engorgement of trigone during sexual excitement. no infection. urethra average caliber

S 326 : at 43. corrugated labia, long self-relief. At time of external erections, arteries stand up and pulsate when almost invisible before : veins small. urethra not more than 8 F.

S454 at 56 : red bladder base with edema : little finger nearly into bladder. Husband has to give friction orgasm : As clitoris erects the meatus outrolls & trigone swells.

S 457 ..... 27 to 44
Obese, 230 lb. unwed at 11; menorrhagia, big breasts, full cockscomb, at 27. 4 fingers hymen, when married, full orgasm. 3 children, small repair: This drawing at 49.
S 460, same, but huge labia, 4 children, no tear.

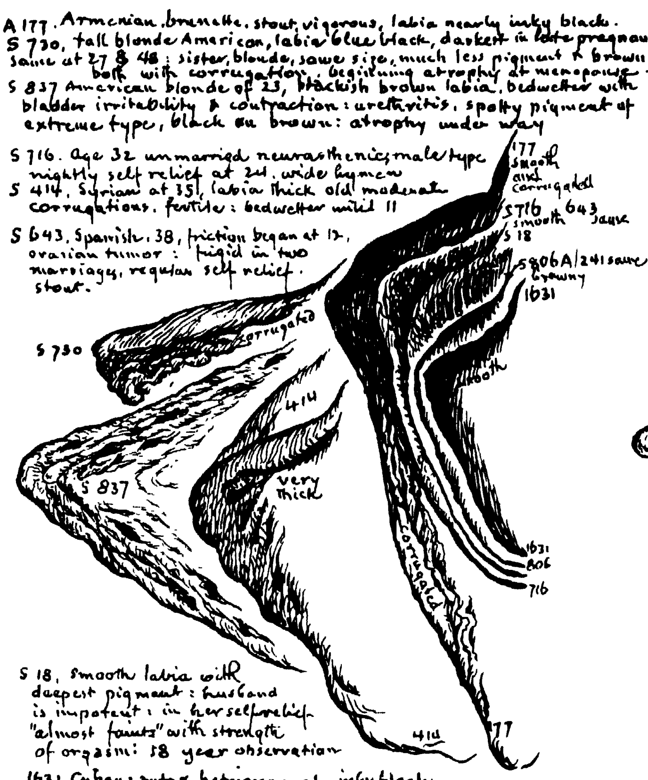
Self relief began at 13 : 1 child. Widow, now 59. As clitoris erects meatus outrolls like anus and gapes : three stages shown #1, 2, 3.

S 3092 at 21 Self relief as often as "a dozen times a day" for months : bladder irritation : the above is maximum engorgement and comes and goes.

Systematic cystoscopy by Dickinson drawings from life.

Bladder base and meatus during sexual excitement

Fig 87



A 177. Armenian, brunette, stout, vigorous, labia nearly inky black.
S 730, tall blonde American, labia blue black, darkest in late pregnancy same at 27 & 48: sister, blonde, same size, much less pigment & brown both with corrugation, beginning atrophy at menopause.
S 837 American blonde of 23, blackish brown labia, bedwetter with bladder irritability & contraction: urethritis, spotty pigment of extreme type, black on brown: atrophy under way

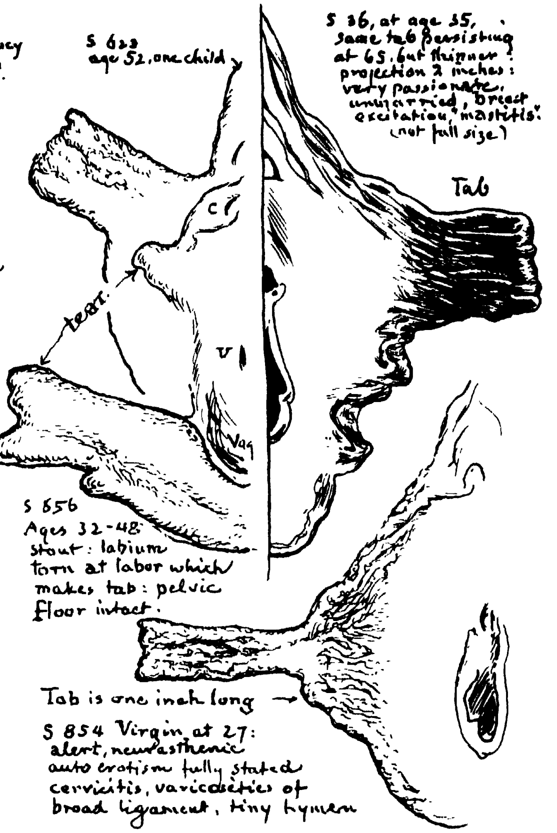
S 716. Age 32 unmarried neurasthenic; male type nightly self relief at 24. wide hymen
S 414, Syrian at 35, labia thick old moderate corrugations. fertile: bedwetter until 11

S 643, Spanish, 38, friction began at 12, ovarian tumor: frigid in two marriages, regular self relief. stout.

S 18, smooth labia with deepest pigment: husband is impotent: in her self relief "almost faints" with strength of orgasm: 58 year observation

1631 Cuban: auto & heterosexual, inky black
(All life unless otherwise stated)

Pigmented labia, of all sizes & surfaces



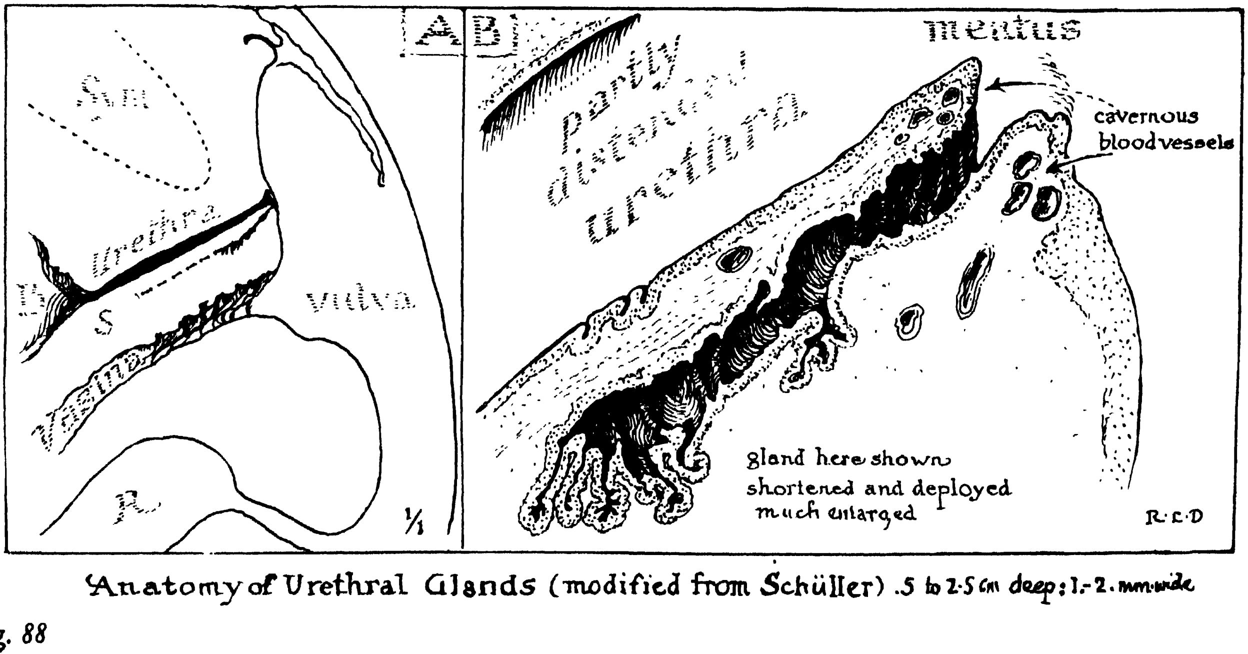
S 36, at age 35, same tab persisting at 65, but thinner: projection 2 inches: very passionate, unmarried, breast excitation, "mastitis". (not full size)

S 656
Ages 32-48
stout: labium torn at labor which makes tab: pelvic floor intact.

Tab is one inch long →

S 854 Virgin at 27: alert, neurasthenic auto erotism fully stated cervicitis, varicosities of broad ligament, tiny hymen

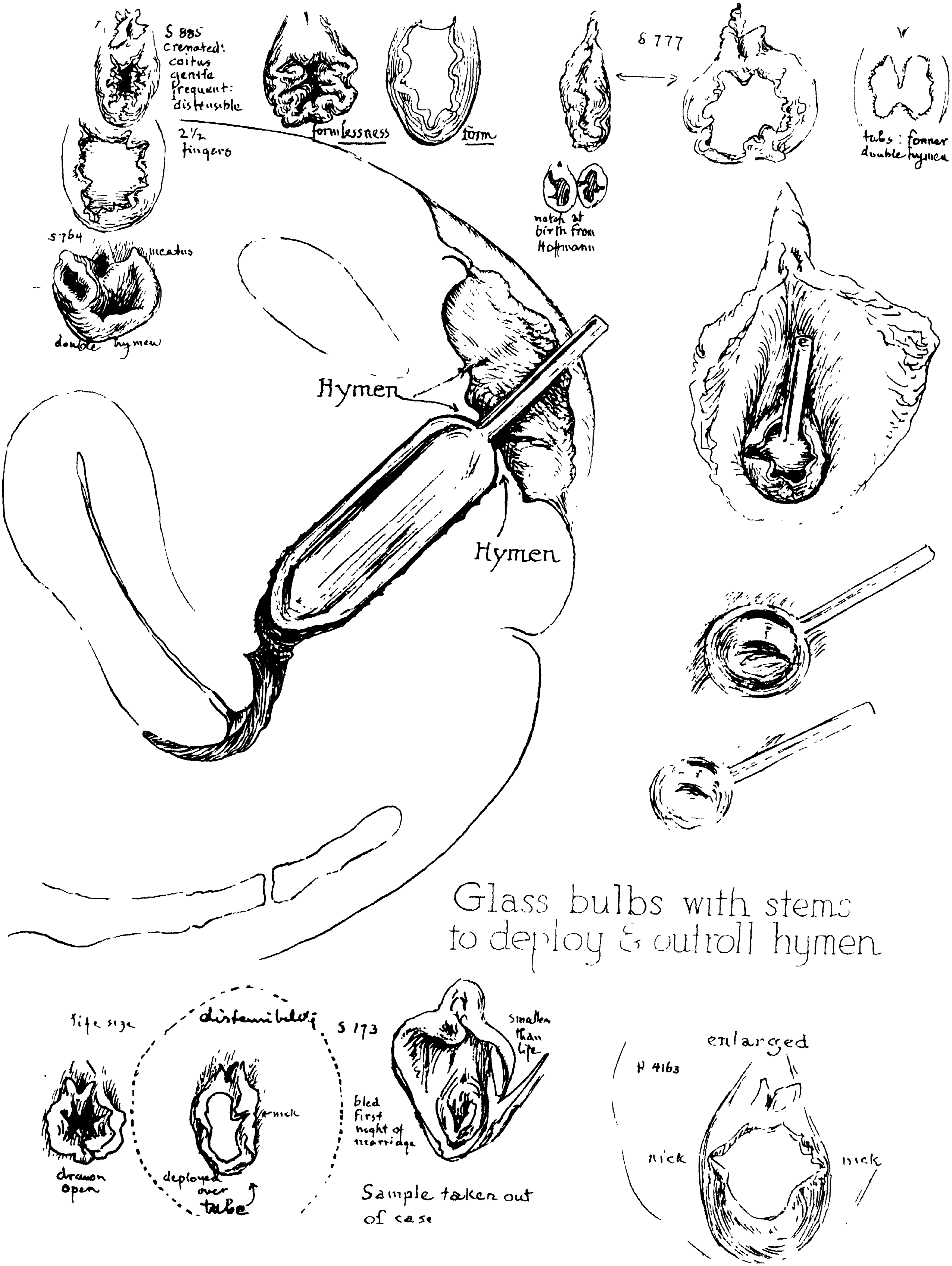
Tabs of labia minora



gland here shown shortened and deployed much enlarged

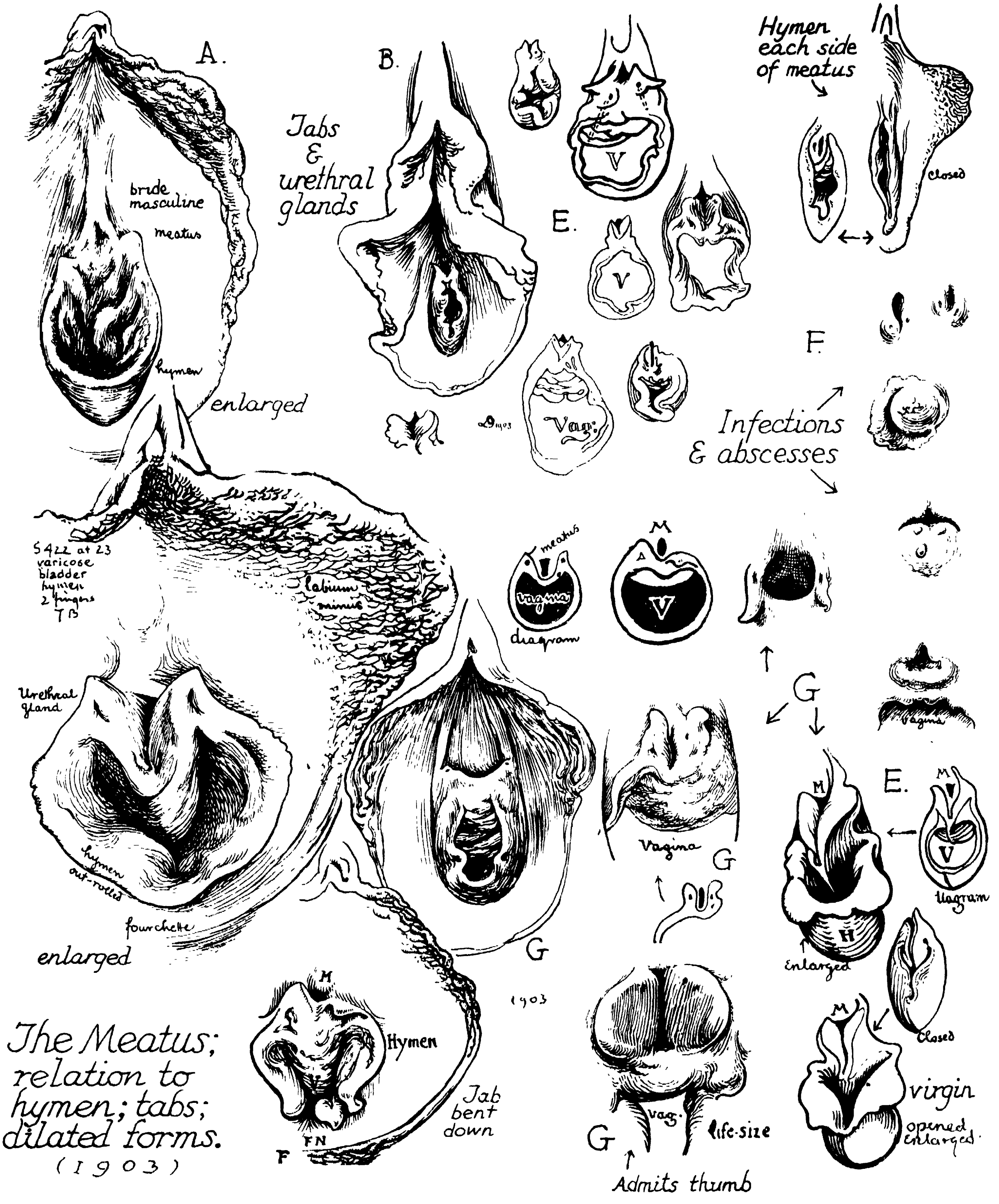
Anatomy of Urethral Glands (modified from Schüller) .5 to 2.5 cm deep: 1.-2. mm wide

Fig. 88



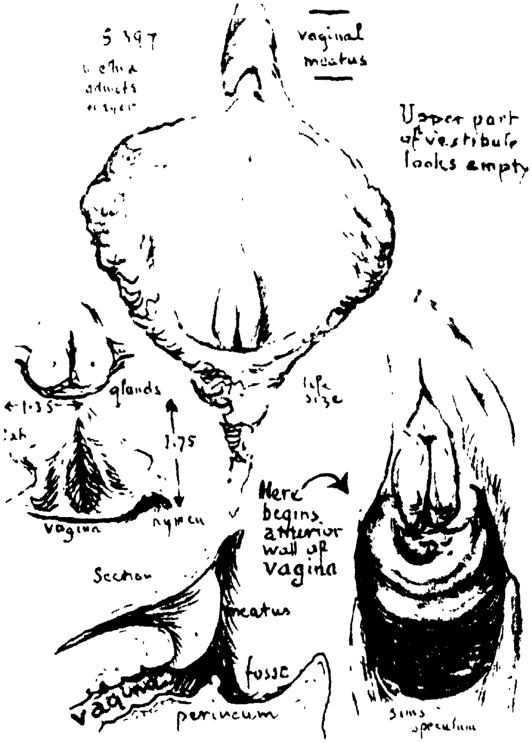
Glass bulbs with stems
to deploy & outroll hymen

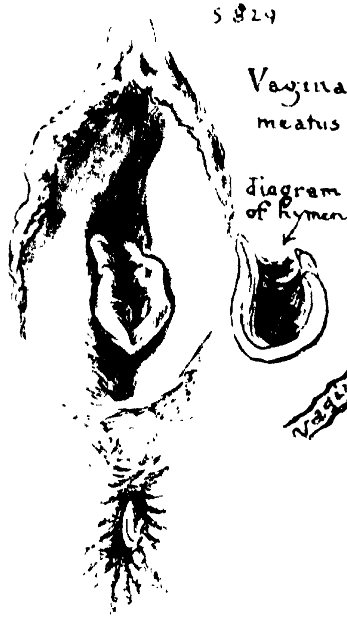
Sample taken out
of case



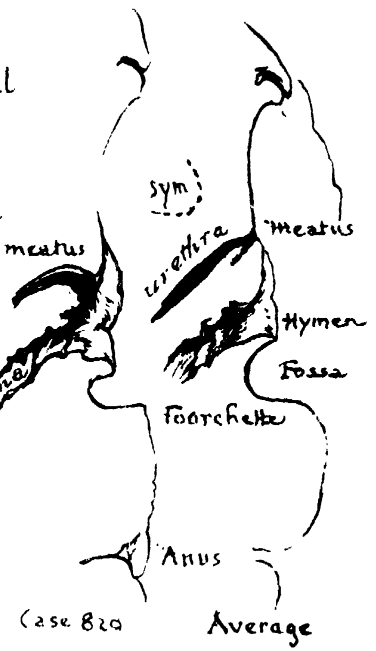
A,B,C, Types of labia belonging with tabs.
E. Forms of urethral labia   G. Dilated, admits finger.
F Infected urethral glands

Fig. 90

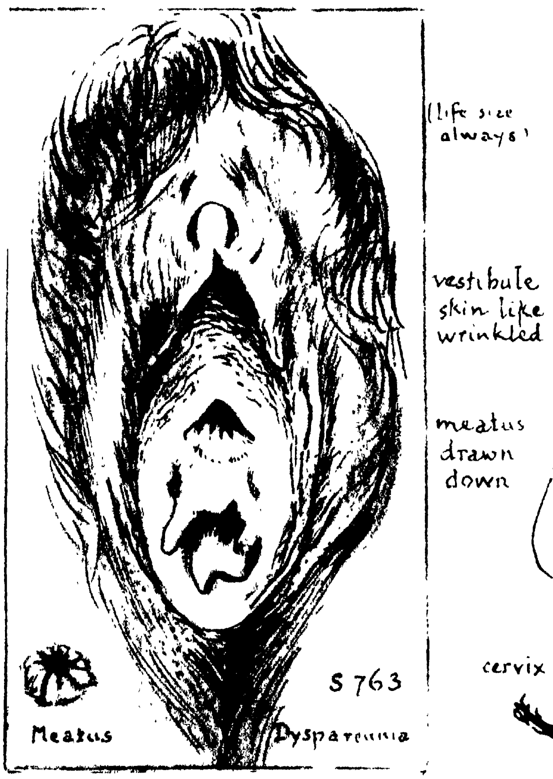




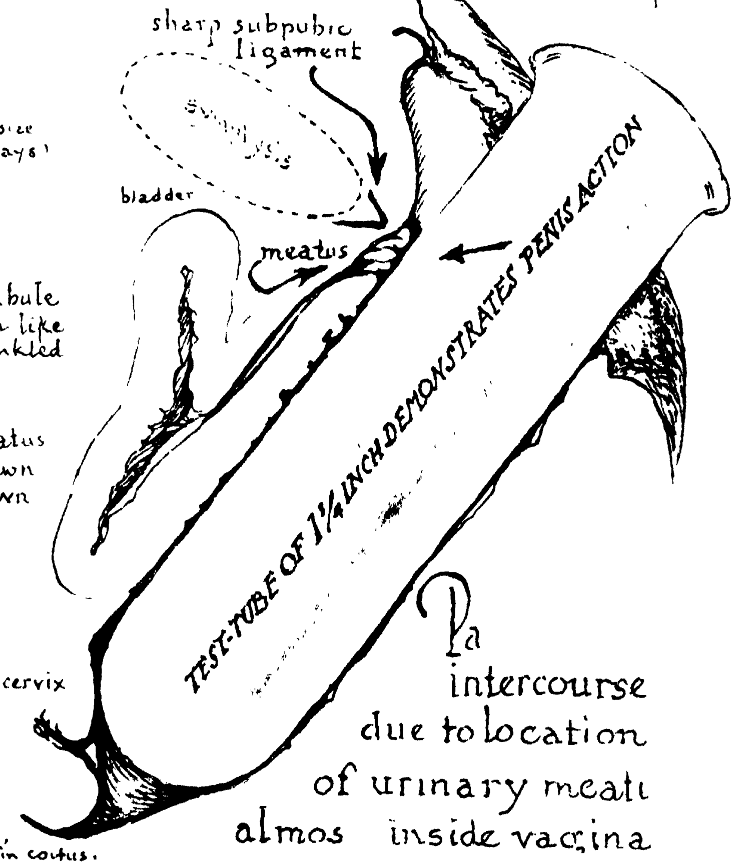
Eight such cases seen and relieved.



Dickinson 1907 to 1928 drawn from life

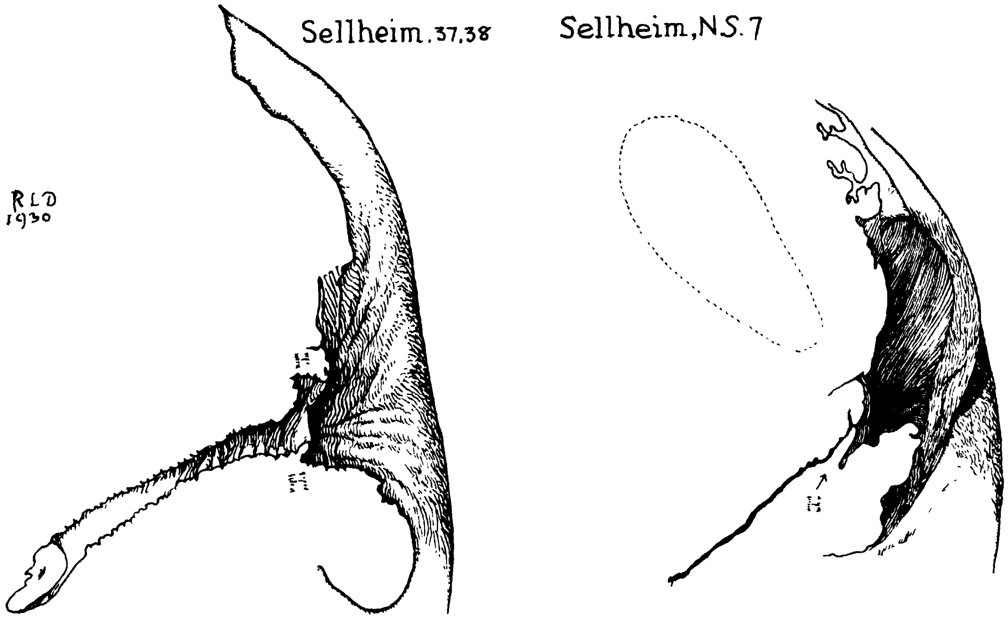


Contusion in coitus and swelling and inflammation relieved by posture, thighs toward chest (lithotomy posture) in coitus.



Da
intercourse
due to location
of urinary meati
almos inside vagina

Fig. 91



Above; Two thin hymens; easily penetrated at marriage or stretched beforehand; fair funnels of entry; preputial folds.

Below; Two thicker hymens, resistant, to be stretched or cut. Funnels fair.

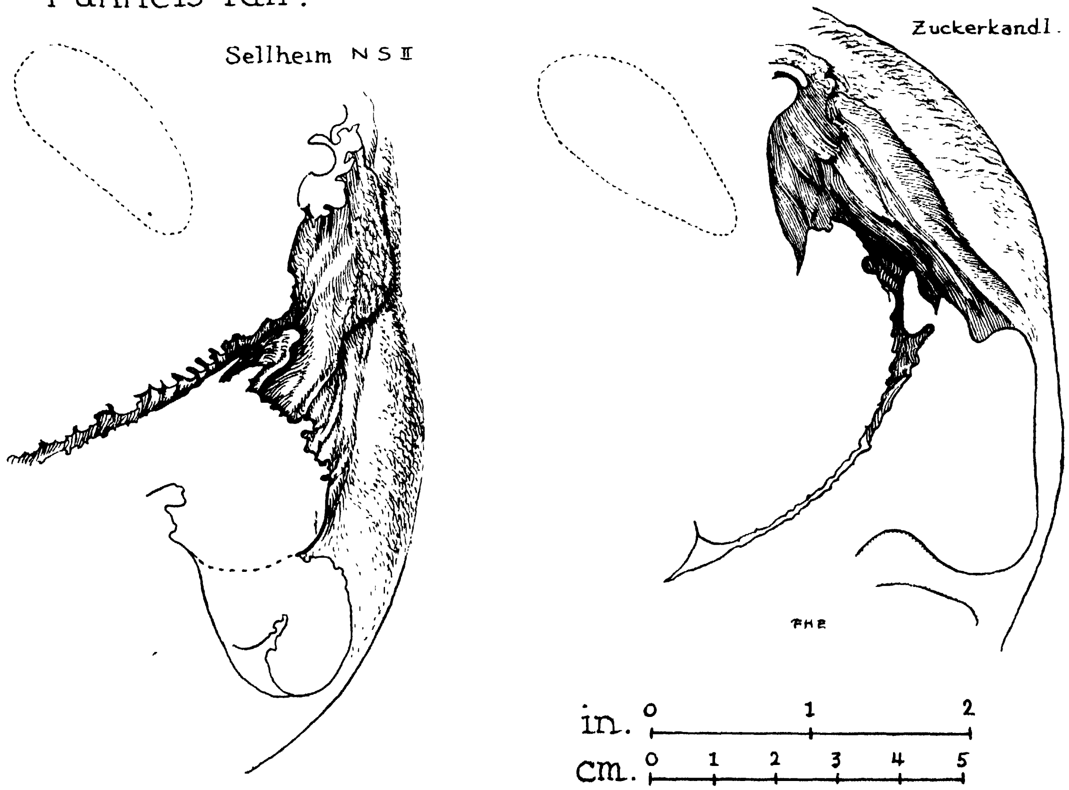
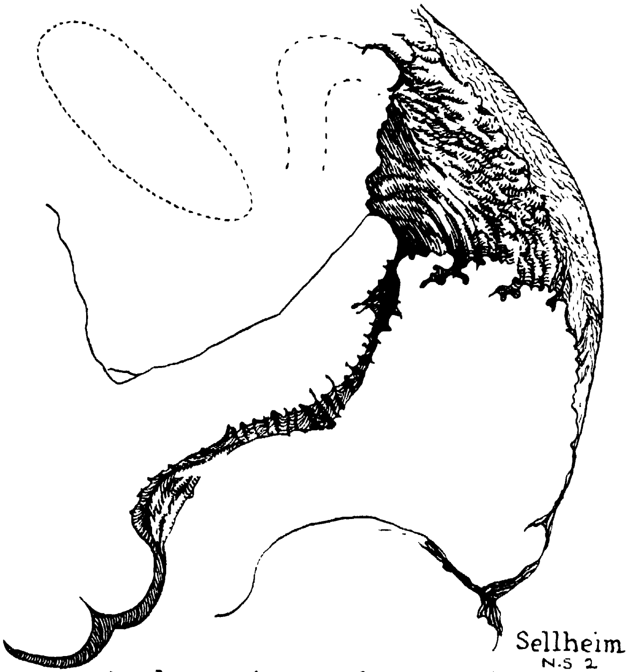
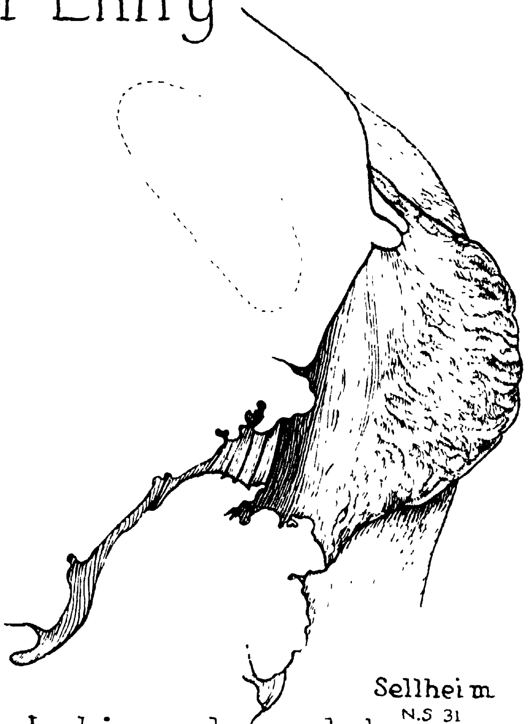


Fig. 92

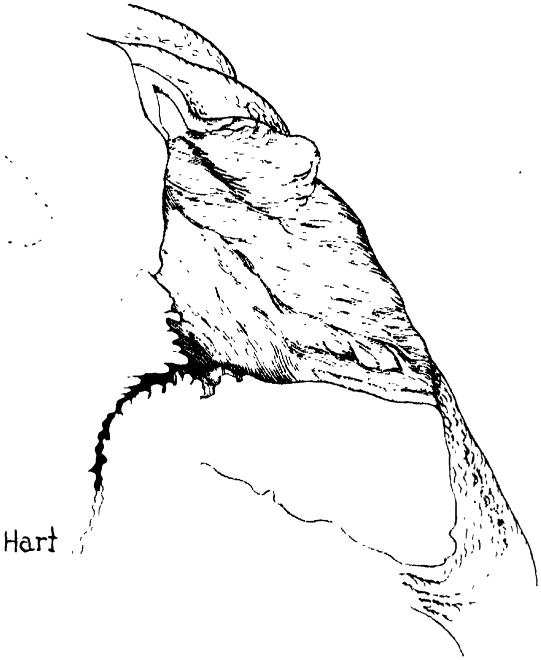
Deep Funnels of Entry



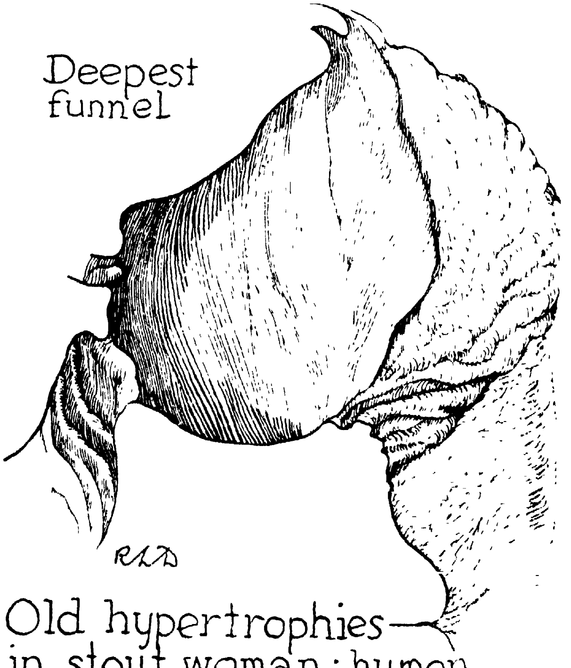
Corrugated vagina, minora, fourchette
hymen probably elastic.



Labia enlarged, hymen
thick, needs cutting.

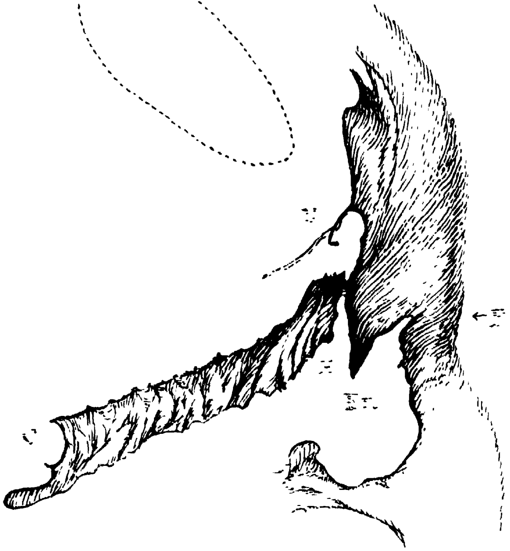


Deep funnel; hymen multiple folds,
probably elastic.

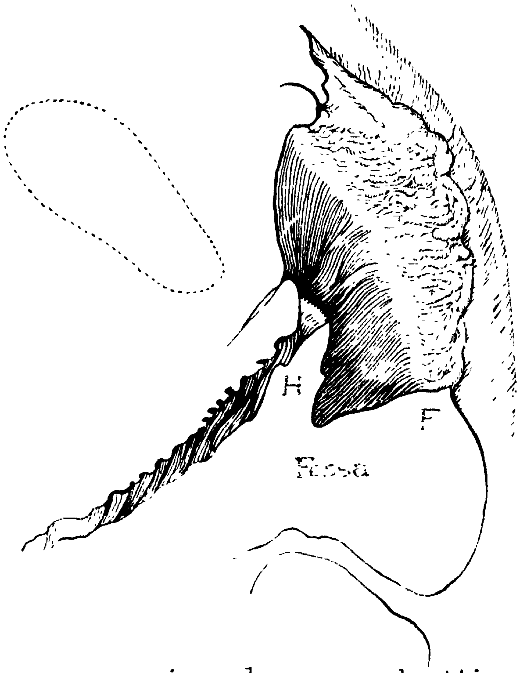


Old hypertrophies
in stout woman; hymen
undamaged by labors

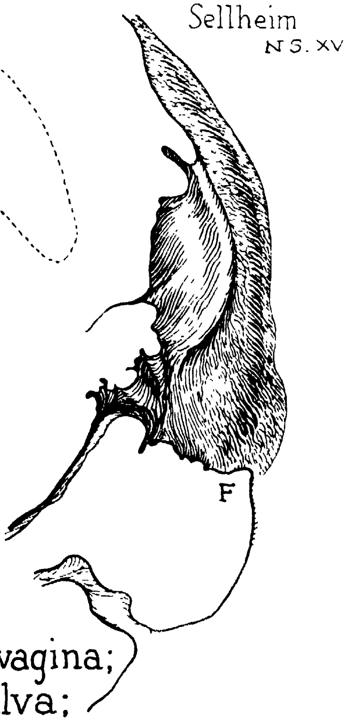
Fig. 93



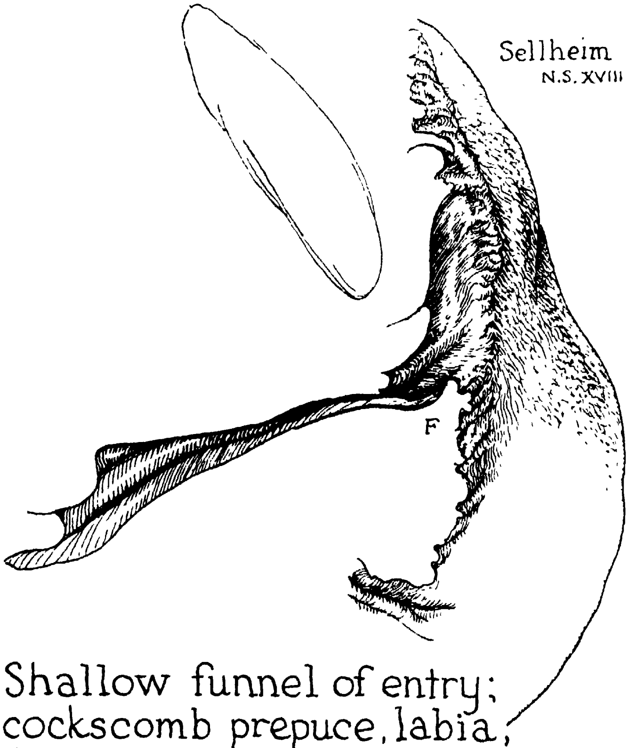
Deep fossa between hymen and fourchette sidetracks penis Rüdiger, Anat.)



Dyspareunia, glans pocketting in fossa; very thick hymen demanded cutting (Case, R.L.D.)

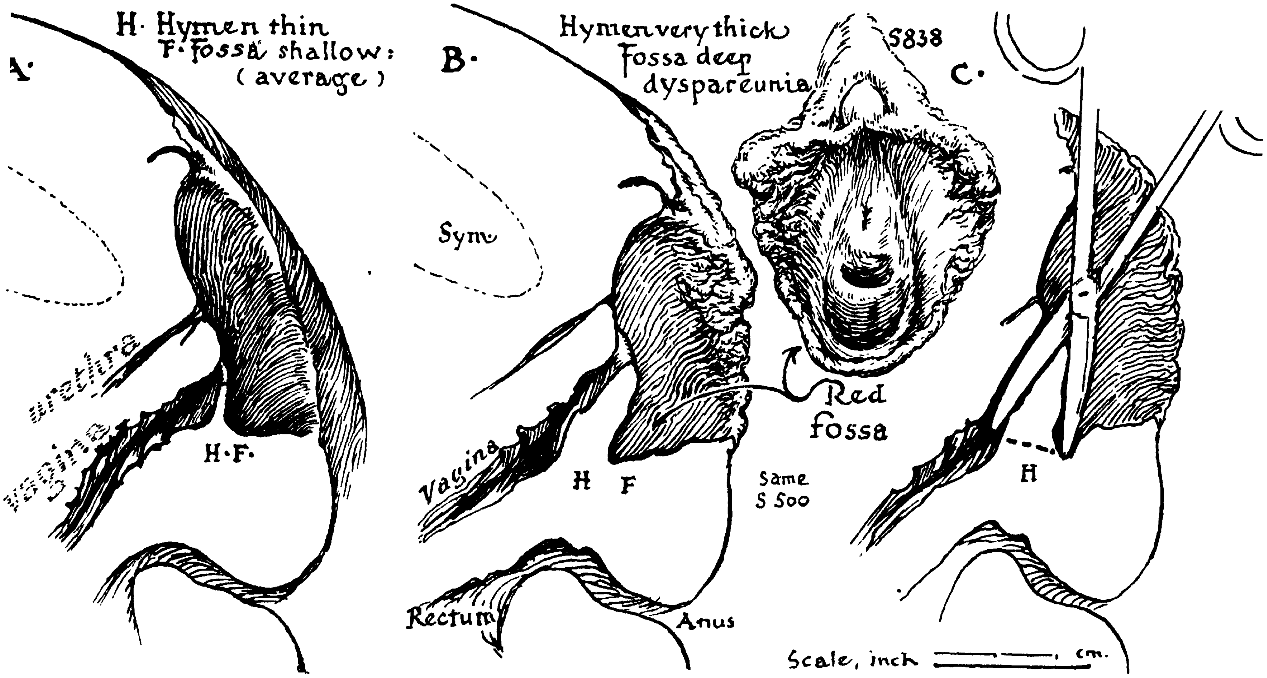


Smooth vagina;
"worn" vulva;
no tear; no fossa.

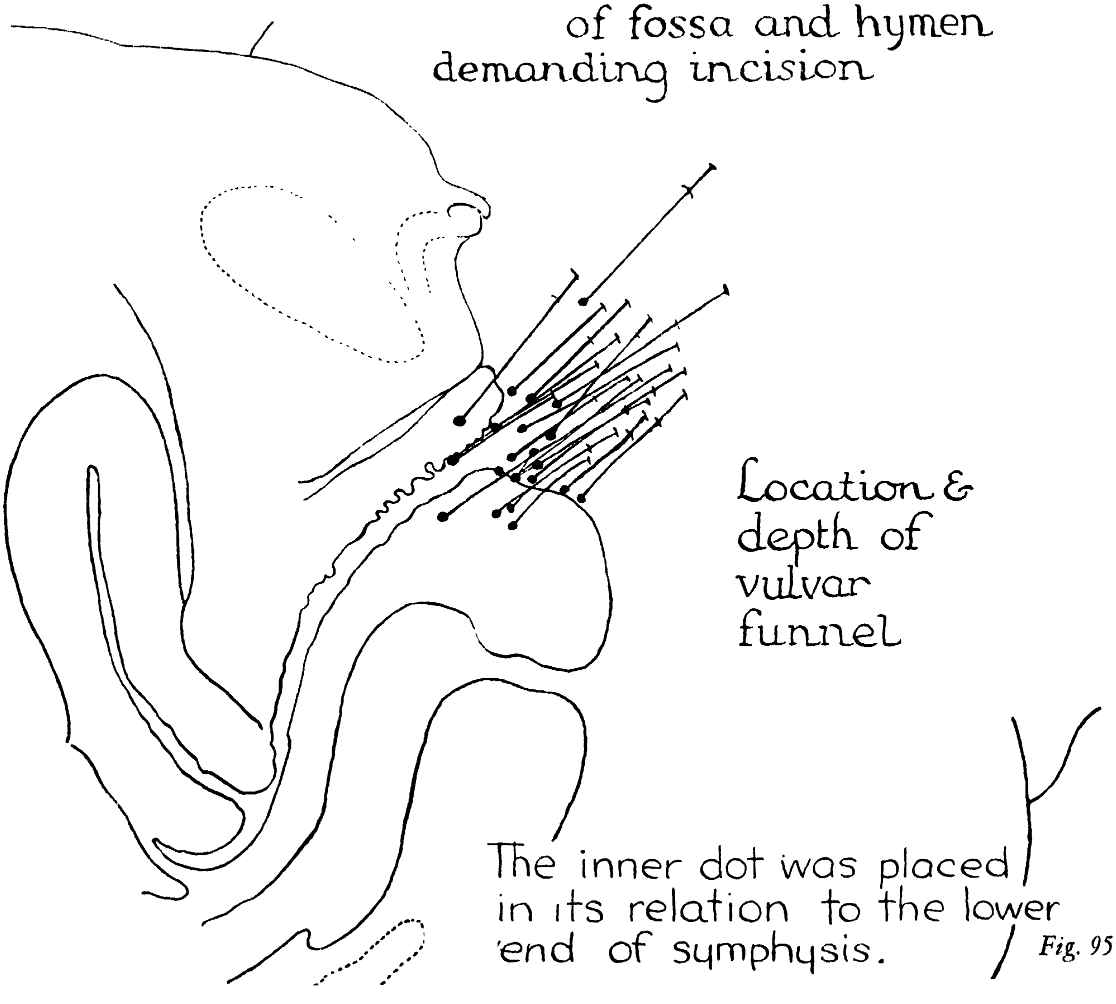


Shallow funnel of entry;
cockscomb prepuce, labia,
fourchette; polished vagina.

Fig. 94



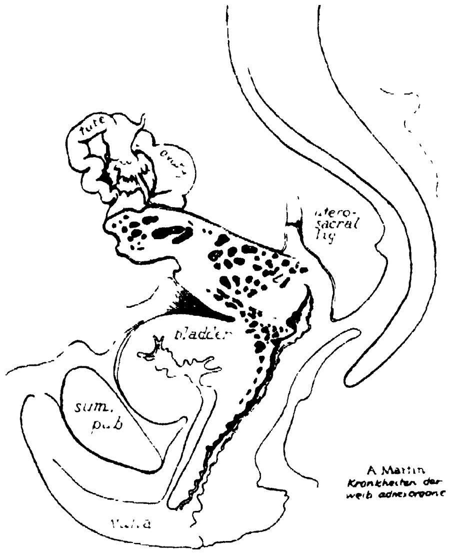
of fossa and hymen
demanding incision



Location &
depth of
vulvar
funnel

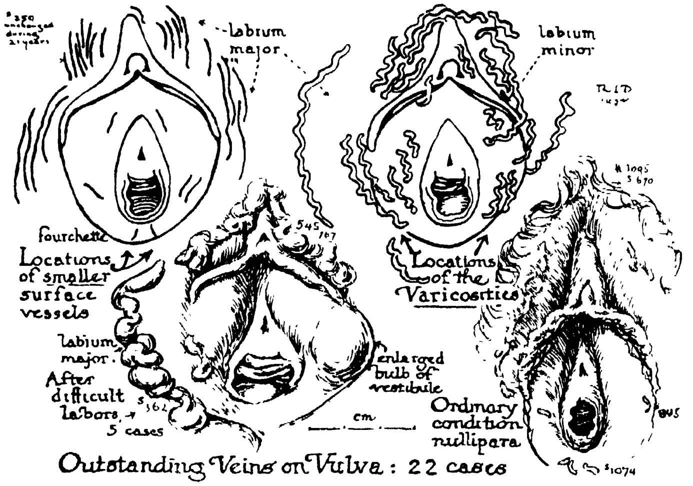
The inner dot was placed
in its relation to the lower
end of symphysis.

Fig. 95



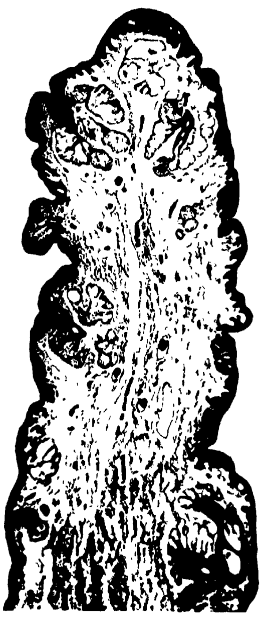
A Martin
Kronkheiten der
weib adnexorgane

Varicose veins of broad ligament

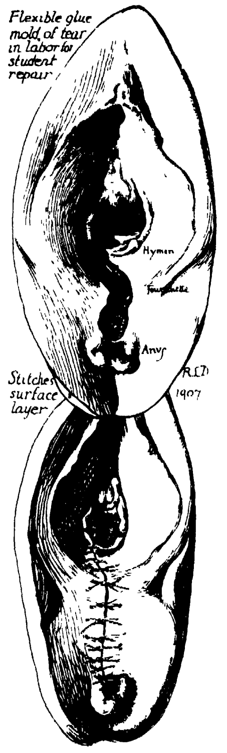

s 250 unchanged during 2 years
labium major
labium minor
R.L.D 1434
fourchette
Locations of smaller surface vessels
545 107
Locations of the Varicosities
N 1095 S 670
labium major.
After difficult labors, 5 cases
s 362
enlarged bulb of vestibule
cm
Ordinary condition nullipara
845
s 1074

Outstanding Veins on Vulva: 22 cases

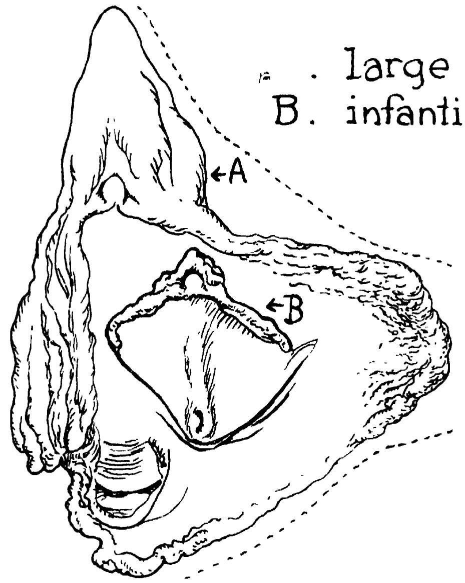
Fig. 9



raph of a labium enlarged
by masturbation in a 30 year old woman.
d Epidermis thickened, sebaceous
ds hypertrophied Many blood vessels
in stroma"
Kehrer in Veit Stoeckel Handbuch, V

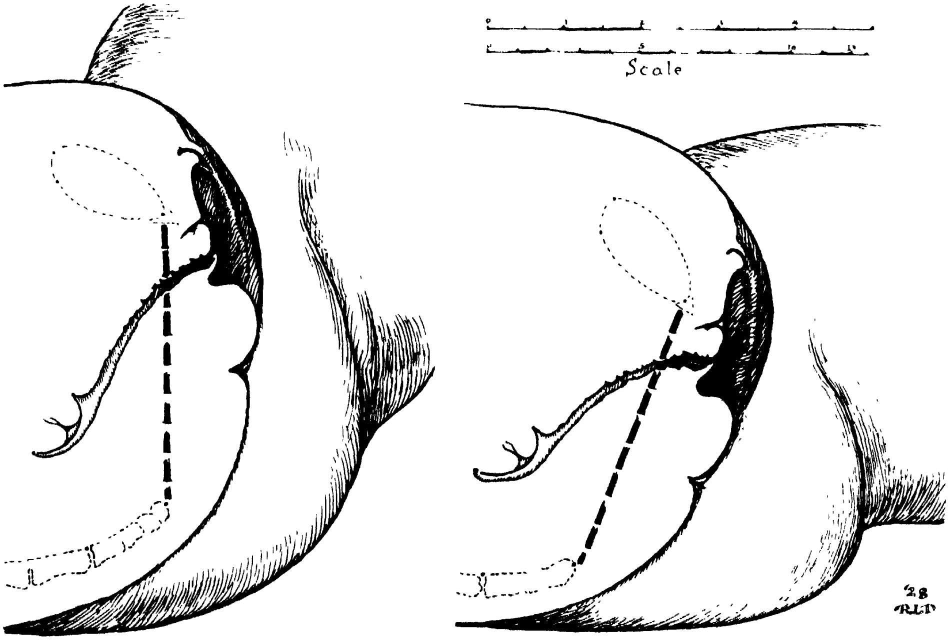


Sizes of Vulva



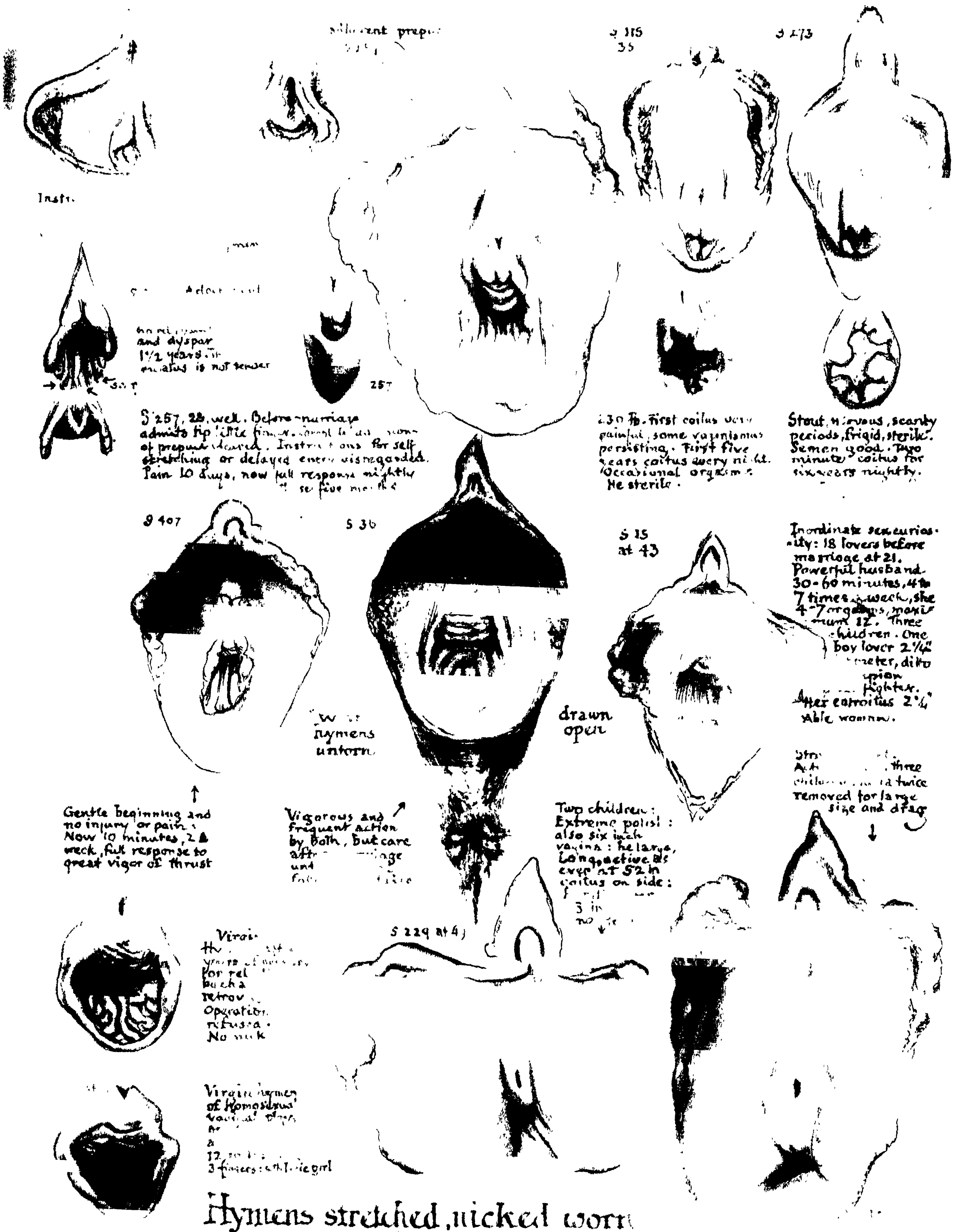
. large
B. infantile

Fig. 97



Vulva apparently set far back owing to tilt of pelvic outlet

Fig. 98



no relief and dyspar[illegible] 1½ years. [illegible] meatus is not tender

S 257, 28, well. Before marriage admits tip little finger [illegible] of prepuce cleared. Instructions for self stretching or delayed entry disregarded. Pain 10 days, now full response nightly [illegible] five months

230 lb. First coitus very painful, some vaginismus persisting. First five years coitus every night. Occasional orgasms. He sterile.

Stout, nervous, scanty periods, frigid, sterile. Semen good. Two minute coitus for six years nightly.

Inordinate sex curiosity: 18 lovers before marriage at 21. Powerful husband. 30-60 minutes, 4 to 7 times a week, she 4-7 orgasms, maximum 12. Three children. One boy lover 2¼" [illegible]meter, ditto [illegible] [illegible] fighter. After introitus 2¼" Able woman.

[illegible] hymens untorn.

Str[illegible] A[illegible] three childr[illegible] twice removed for large size and drag

Gentle beginning and no injury or pain: Now 10 minutes, 2 a week, full response to great vigor of thrust

Vigorous and frequent action by both, but care after marriage [illegible]

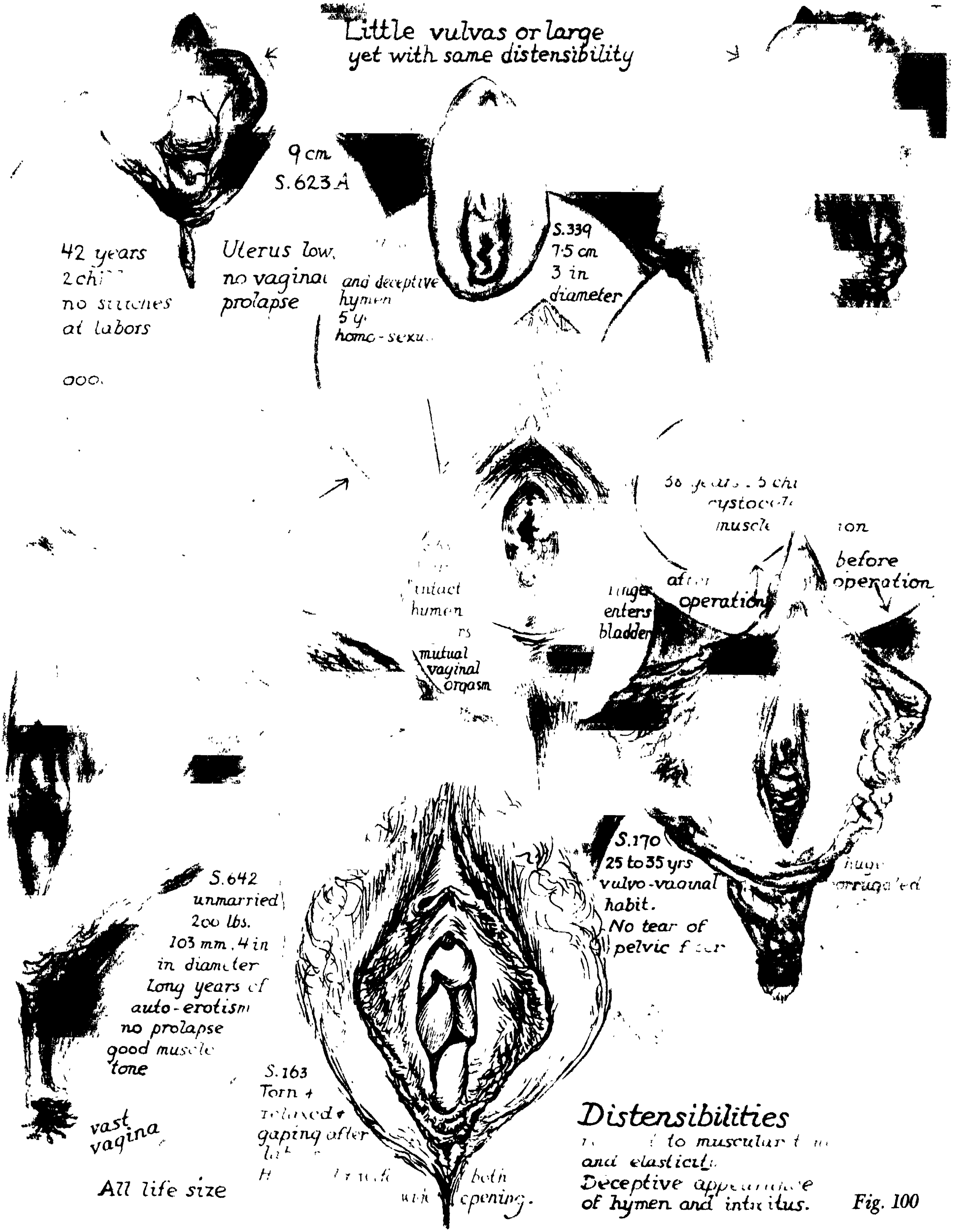
Two children: Extreme polish: also six inch vagina: he large, Long active as ever at 52 in coitus on side: [illegible] 3 in[illegible] no [illegible]

Virgin Hy[illegible] years of [illegible] for rel[illegible] backa[illegible] retrov[illegible] Operation refused. No [illegible]

Virgin hymen of Homosexual vaginal [illegible] [illegible] a 12 [illegible] 3 fingers [illegible] girl

Hymens stretched, nicked, worn and gone

Fig. 99



Distensibilities
to muscular tone
and elasticity.
Deceptive appearance
of hymen and introitus.

Fig. 100

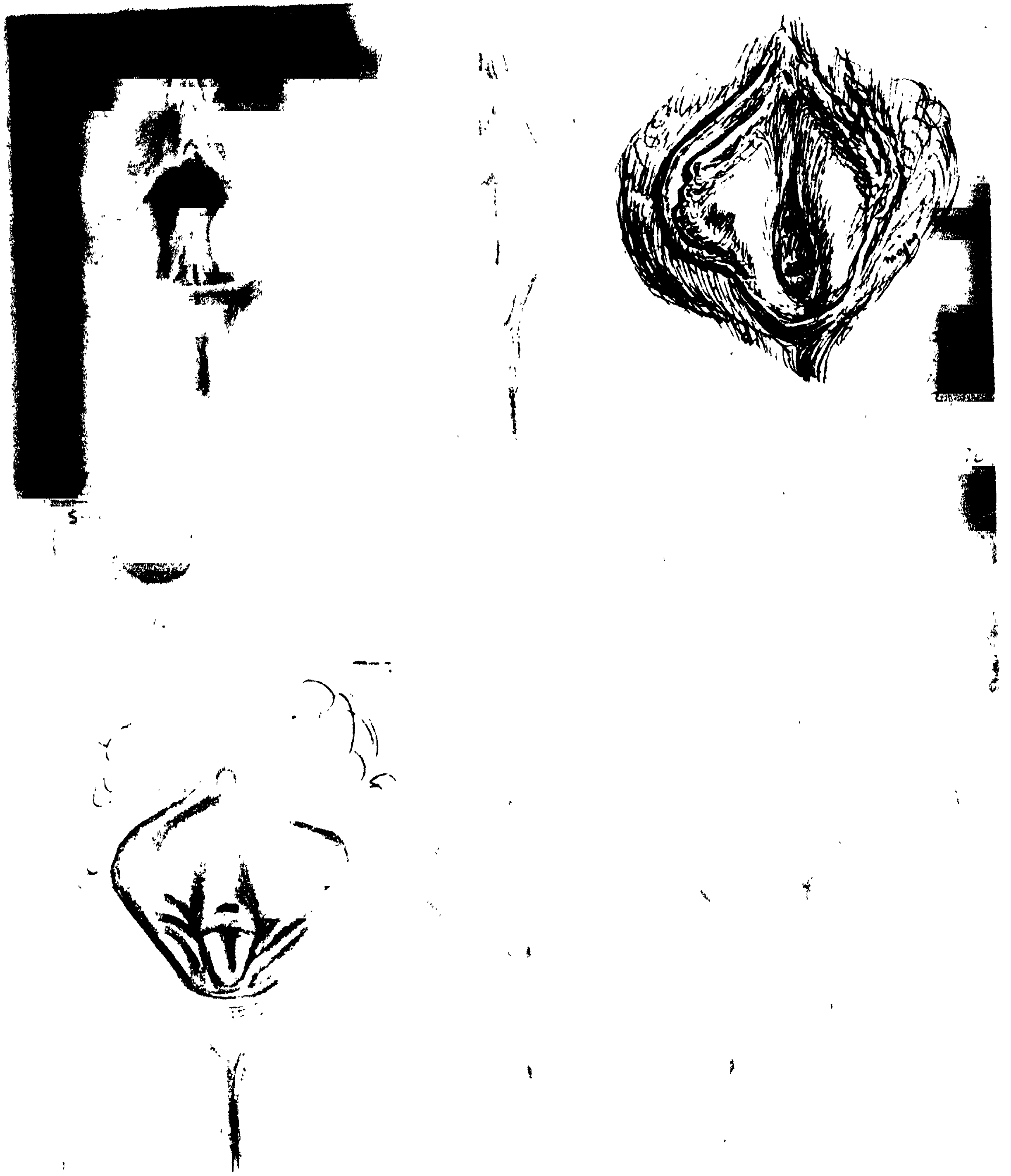
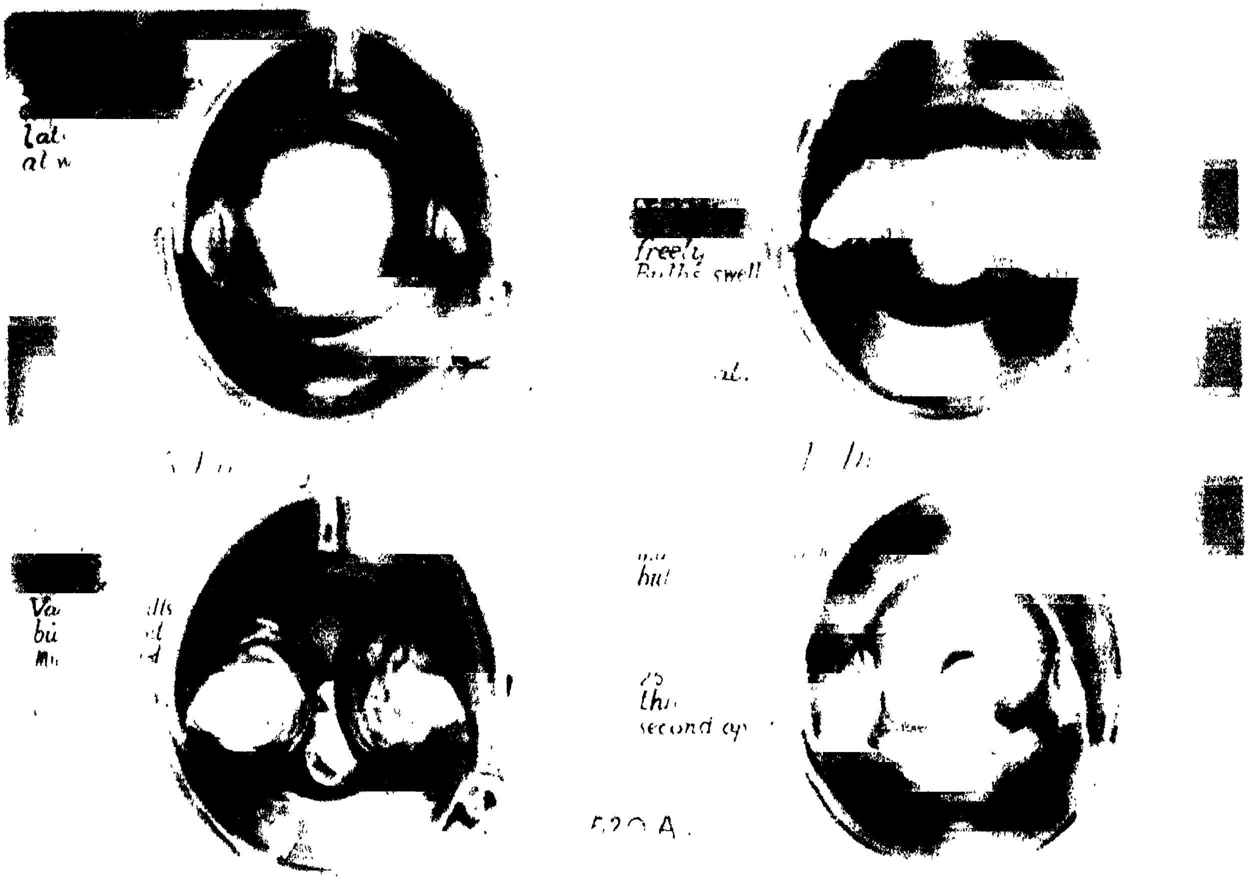


Fig. 101



C Just belo gasm

C cal and Vagina aviour

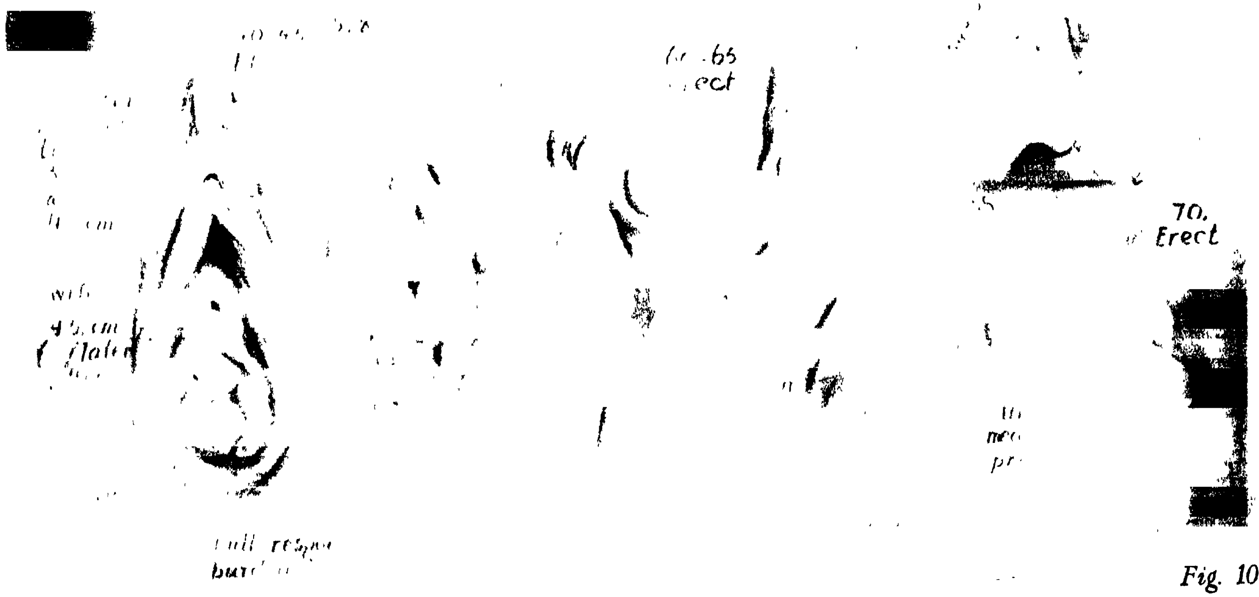


Fig. 102

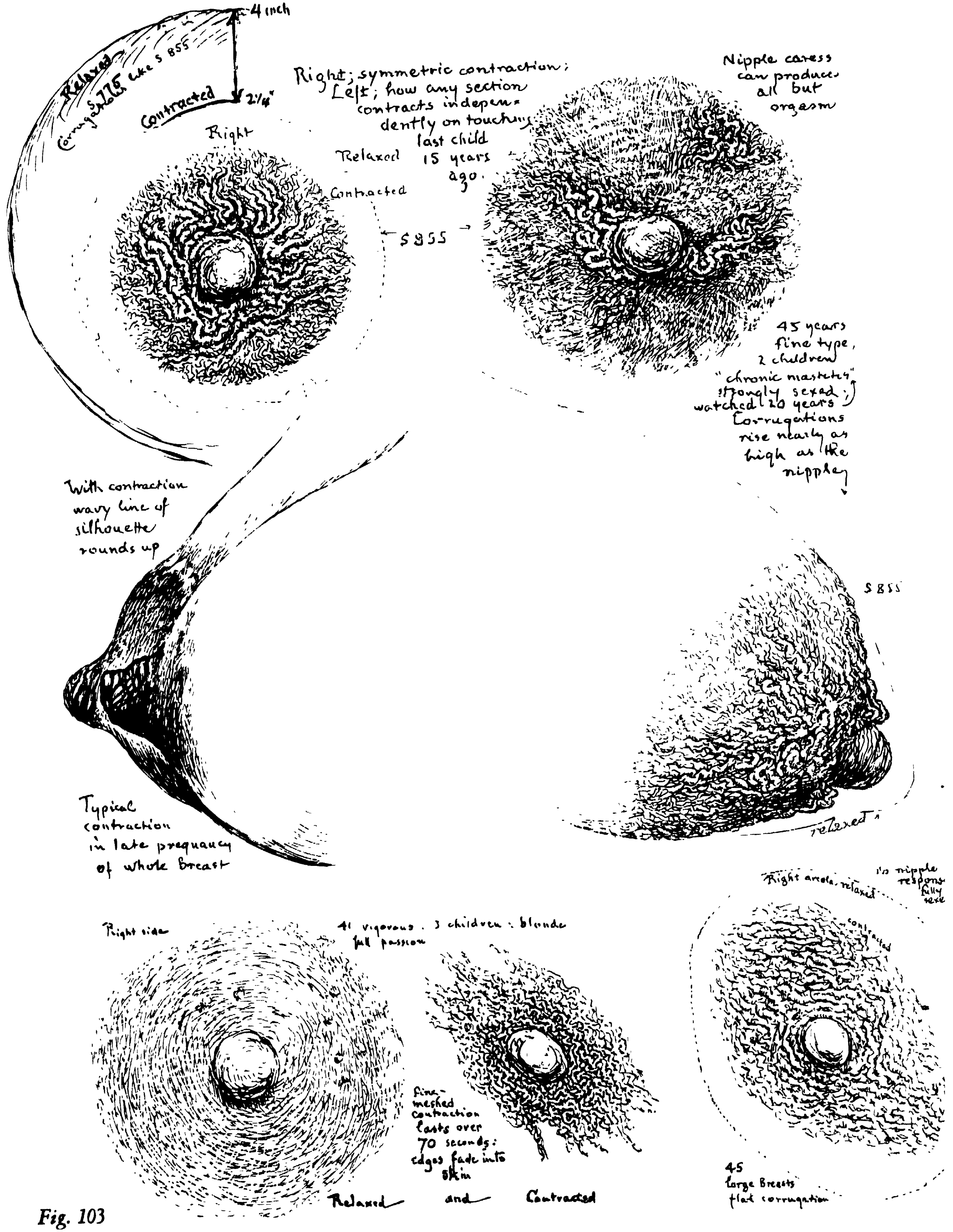

4 inch
Relaxed
Corrugations S 775 like S 855
Contracted
2¼"
Right
Right; symmetric contraction;
Left; how any section
contracts indepen-
dently on touching
last child
15 years
ago.
Relaxed
Contracted
S 855
Nipple caress
can produce
all but
orgasm
45 years
fine type,
2 children
"chronic mastitis"
strongly sexed;
watched 20 years
Corrugations
rise nearly as
high as the
nipple
With contraction
wavy line of
silhouette
rounds up
Typical
contraction
in late pregnancy
of whole breast
S 855
relaxed
Right side
41 vigorous. 3 children: blonde
full passion
fine-
meshed
contraction
lasts over
70 seconds:
edges fade into
skin
Relaxed and Contracted
Right areola relaxed
contracted
I's nipple
respons
fully
sexe
45
Large Breasts
flat corrugation

Fig. 103

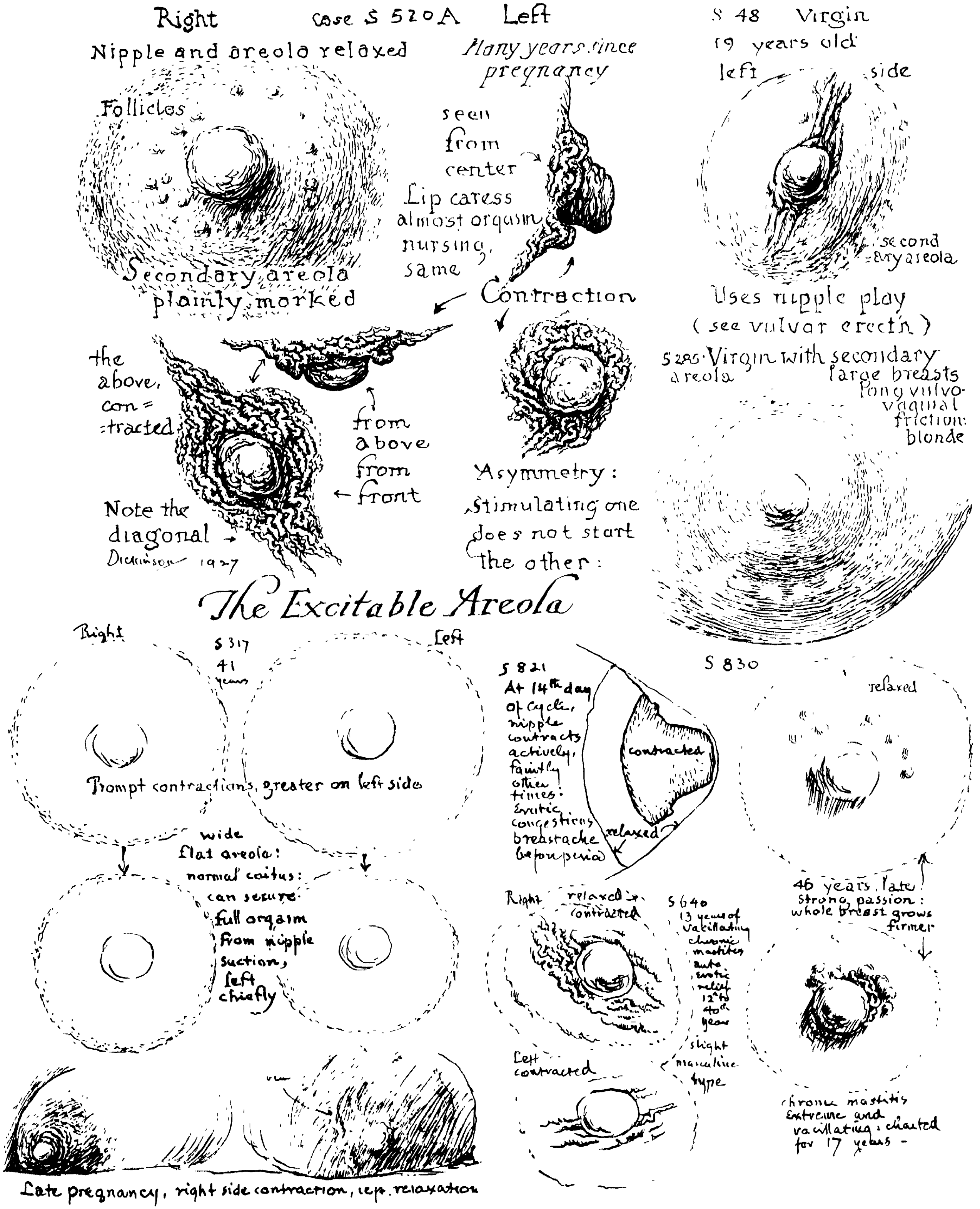
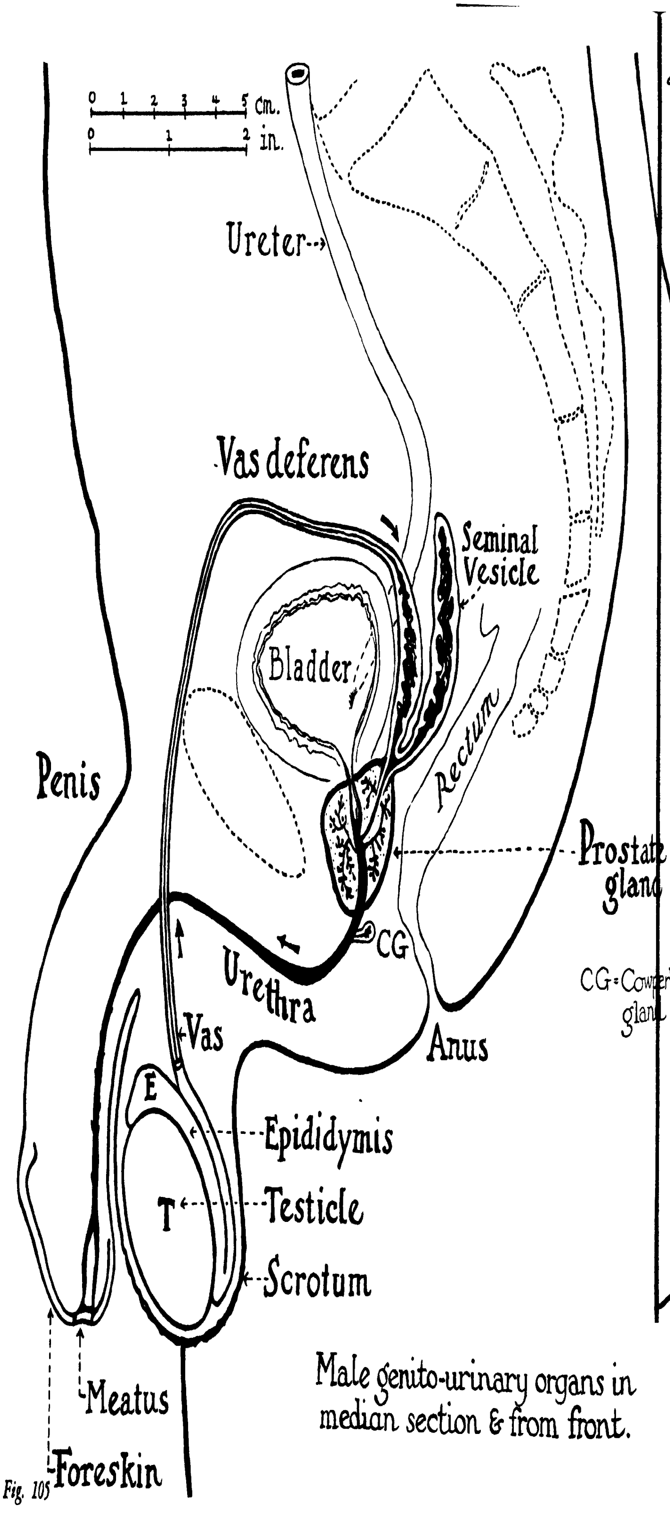

Right
case S 520 A
Left
Nipple and areola relaxed
Many years since pregnancy
Follicles
Secondary areola plainly marked
seen from center
Lip caress almost orgasm
nursing, same
Contraction
the above, con=tracted
from above
from front
Note the diagonal
Dickinson 1927
Asymmetry: Stimulating one does not start the other:
S 48 Virgin
19 years old
left side
second ary areola
Uses nipple play
(see vulvar erectn)
S 285 Virgin with secondary areola
large breasts
long vulvo-vaginal friction:
blonde
The Excitable Areola
Right
S 317
41 years
Left
Prompt contractions, greater on left side
wide flat areola: normal coitus: can secure full orgasm from nipple suction, left chiefly
Late pregnancy, right side contraction, left relaxation
S 821
At 14th day of cycle, nipple contracts actively, faintly other times: Erotic congestions breastache before period
contracted
relaxed
S 830
relaxed
46 years. late strong passion: whole breast grows firmer
chronic mastitis extreme and vacillating: charted for 17 years -
Right relaxed → contracted
S 640
13 years of vacillating chronic mastitis
auto erotic relief 12th to 40th year
slight masculine type
Left contracted

Fig. 104

CHAPTER VI

MALE GENITAL ANATOMY

Text and commentary pages 71 to 83
Figures 105 to 124



Male genito-urinary organs in median section & from front.

Fig. 105

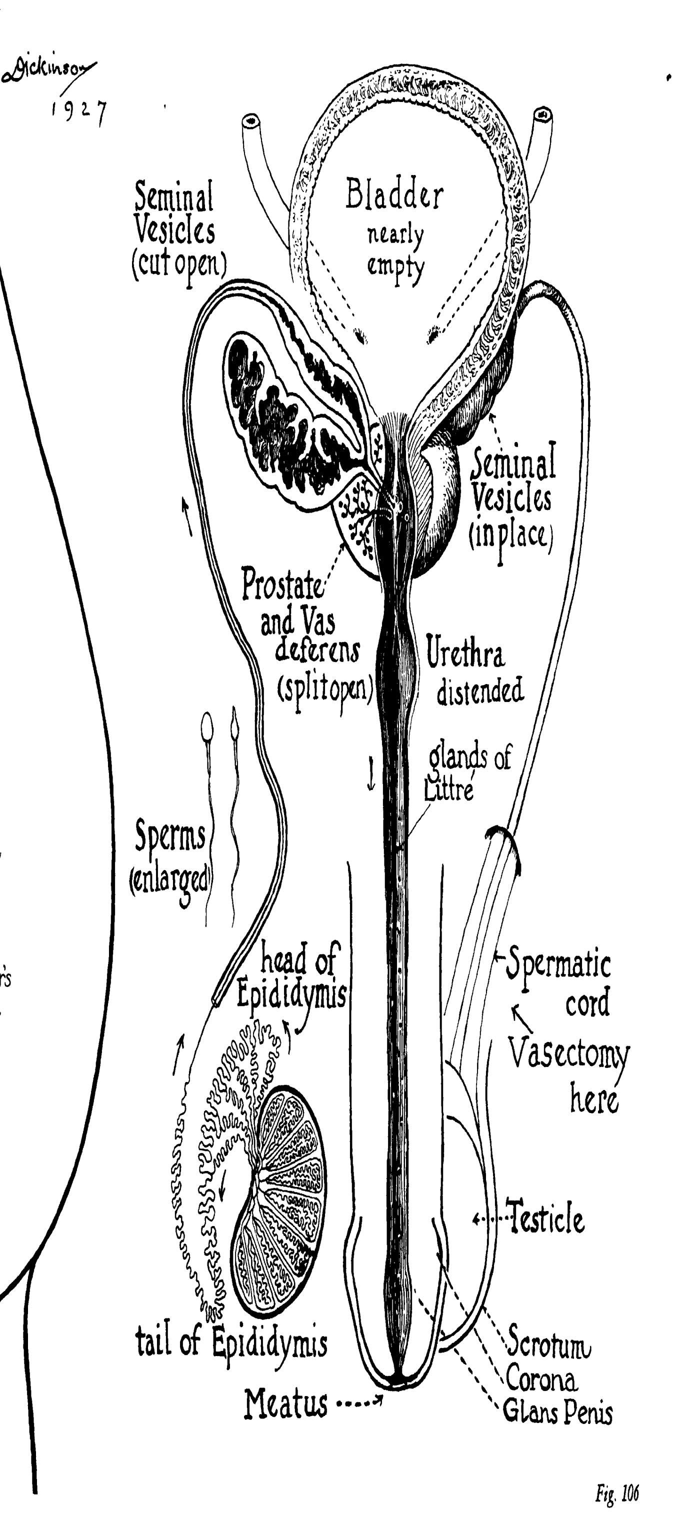


Fig. 106

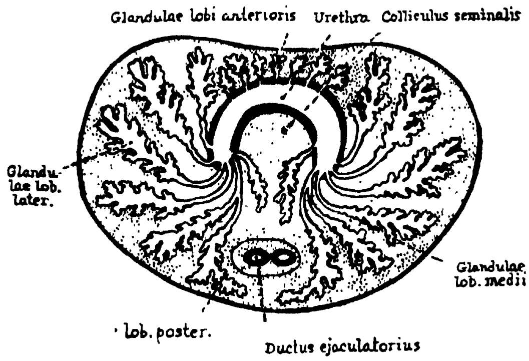
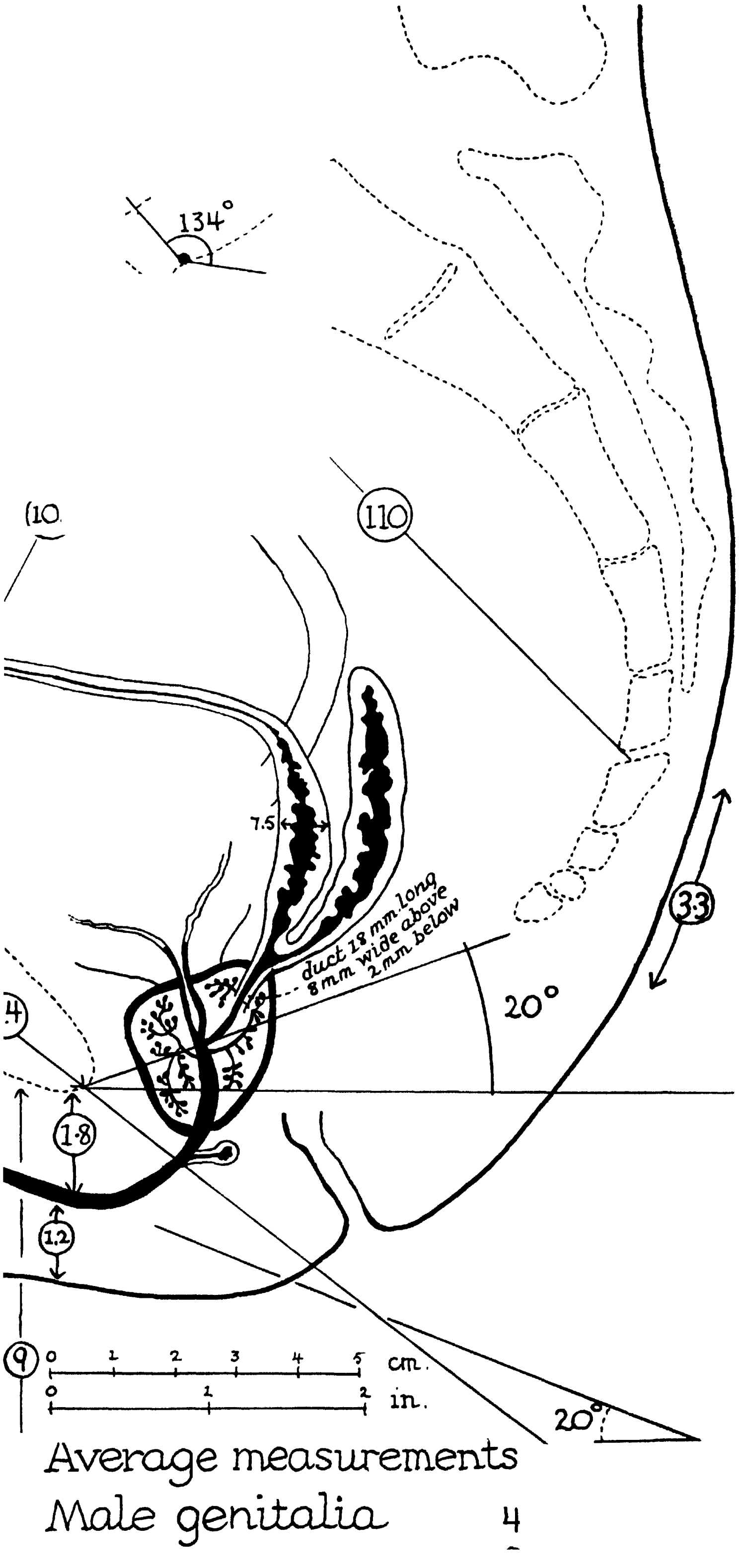
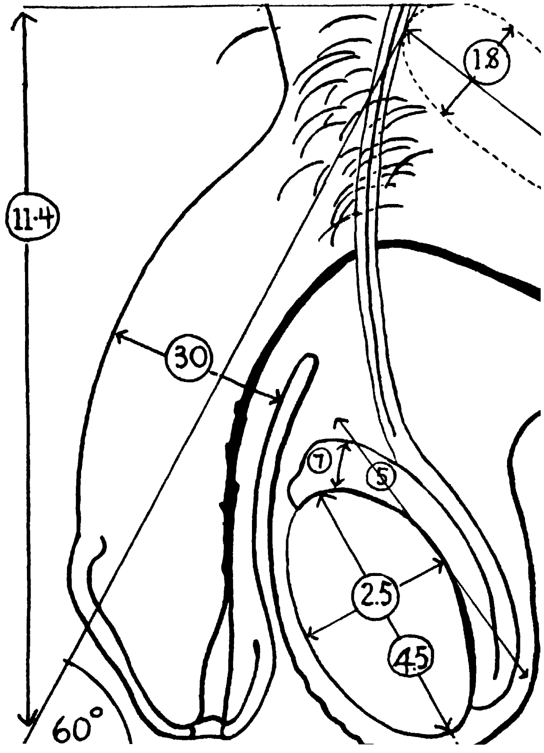


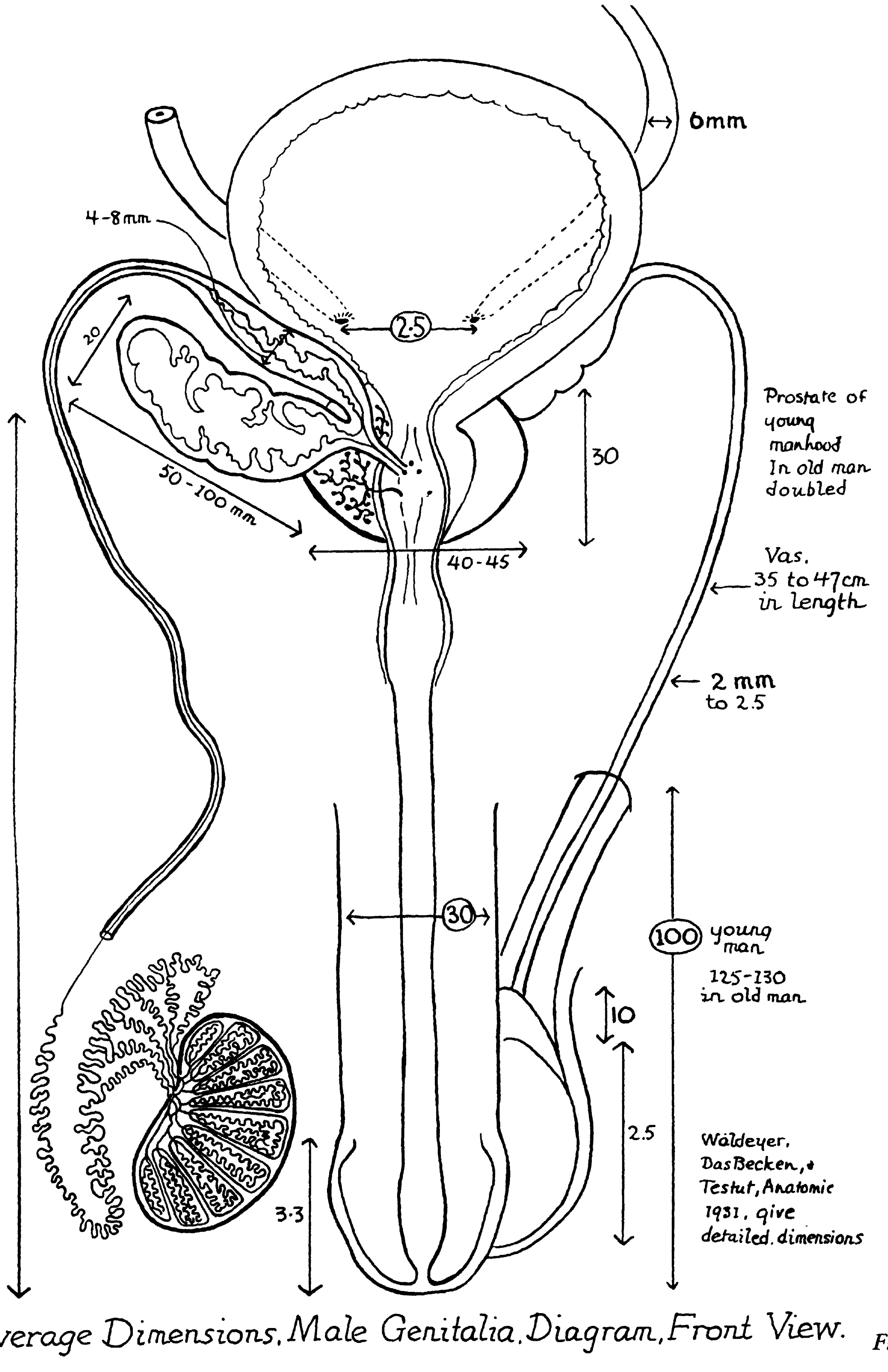
Diagram of glands in prostate
Tandler. Anat. II. 247





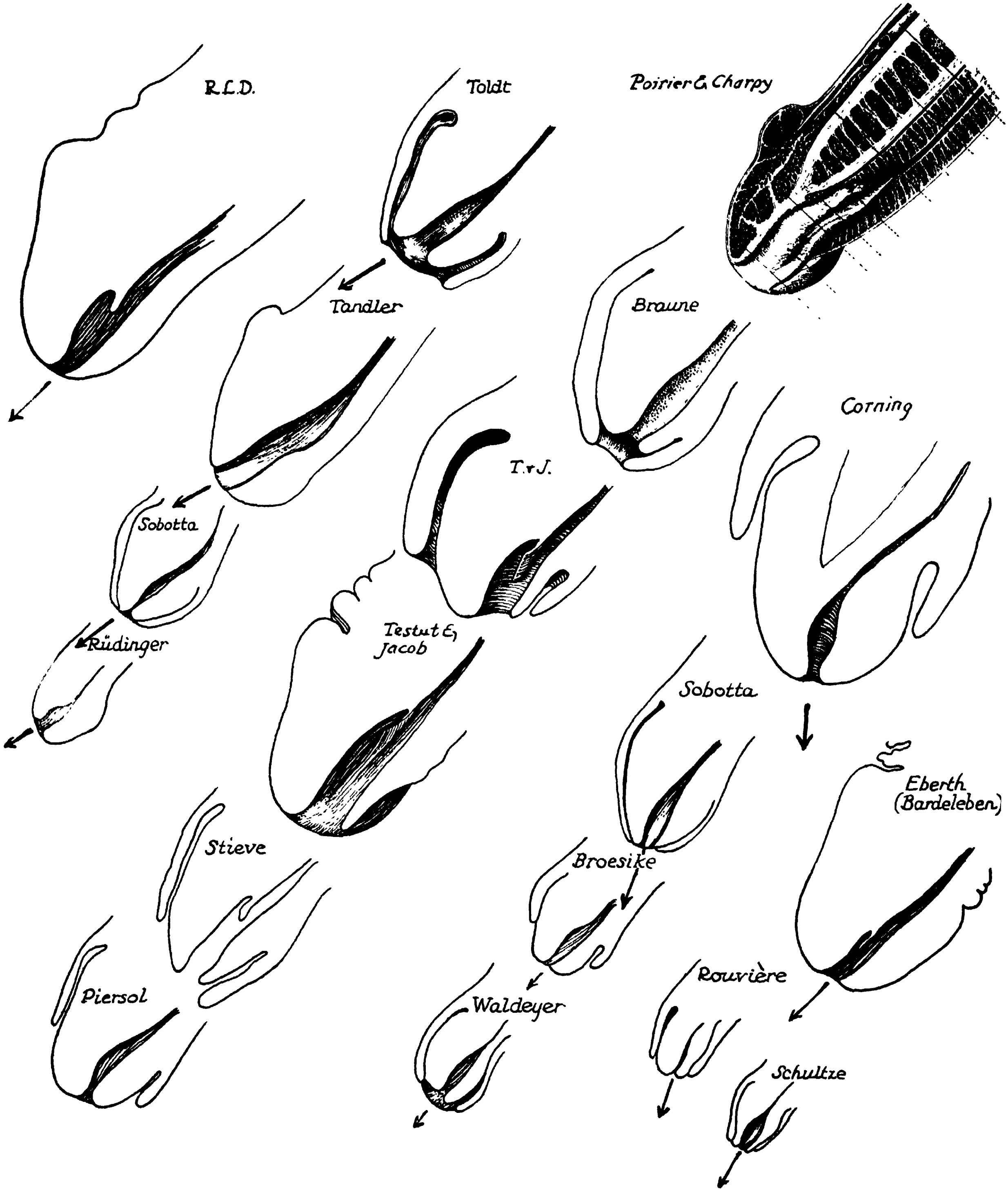
Average measurements
Male genitalia

Fig. 107



Wäldeyer, Das Becken, + Testut, Anatomie 1931, give detailed dimensions

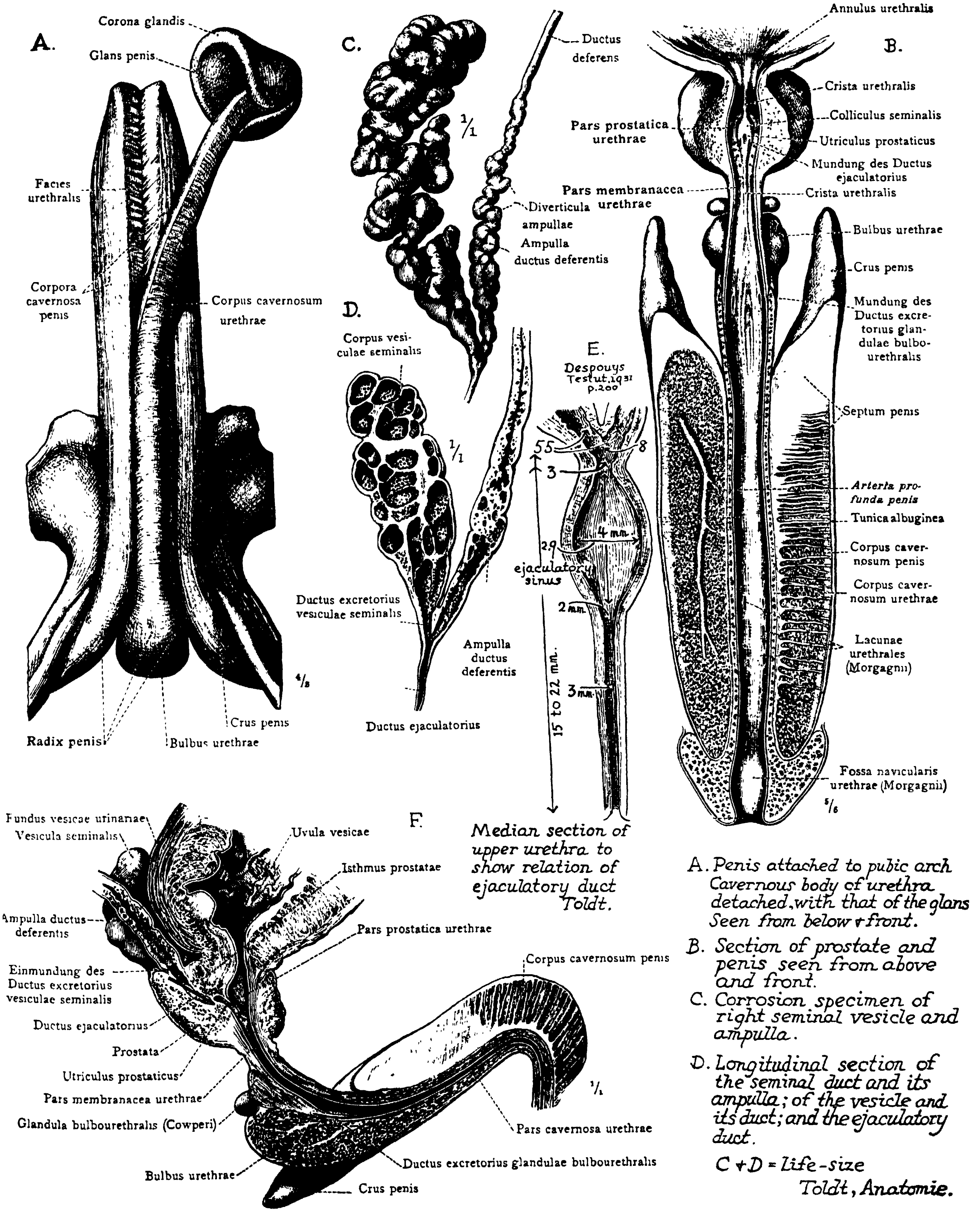
Average Dimensions, Male Genitalia, Diagram, Front View. *Fig. 108*



Male meatus from anatomies, in position of usual coital posture

Direction of exit of semen

Fig. 109



Median section of upper urethra to show relation of ejaculatory duct
Toldt.

A. Penis attached to pubic arch. Cavernous body of urethra detached, with that of the glans. Seen from below & front.

B. Section of prostate and penis seen from above and front.

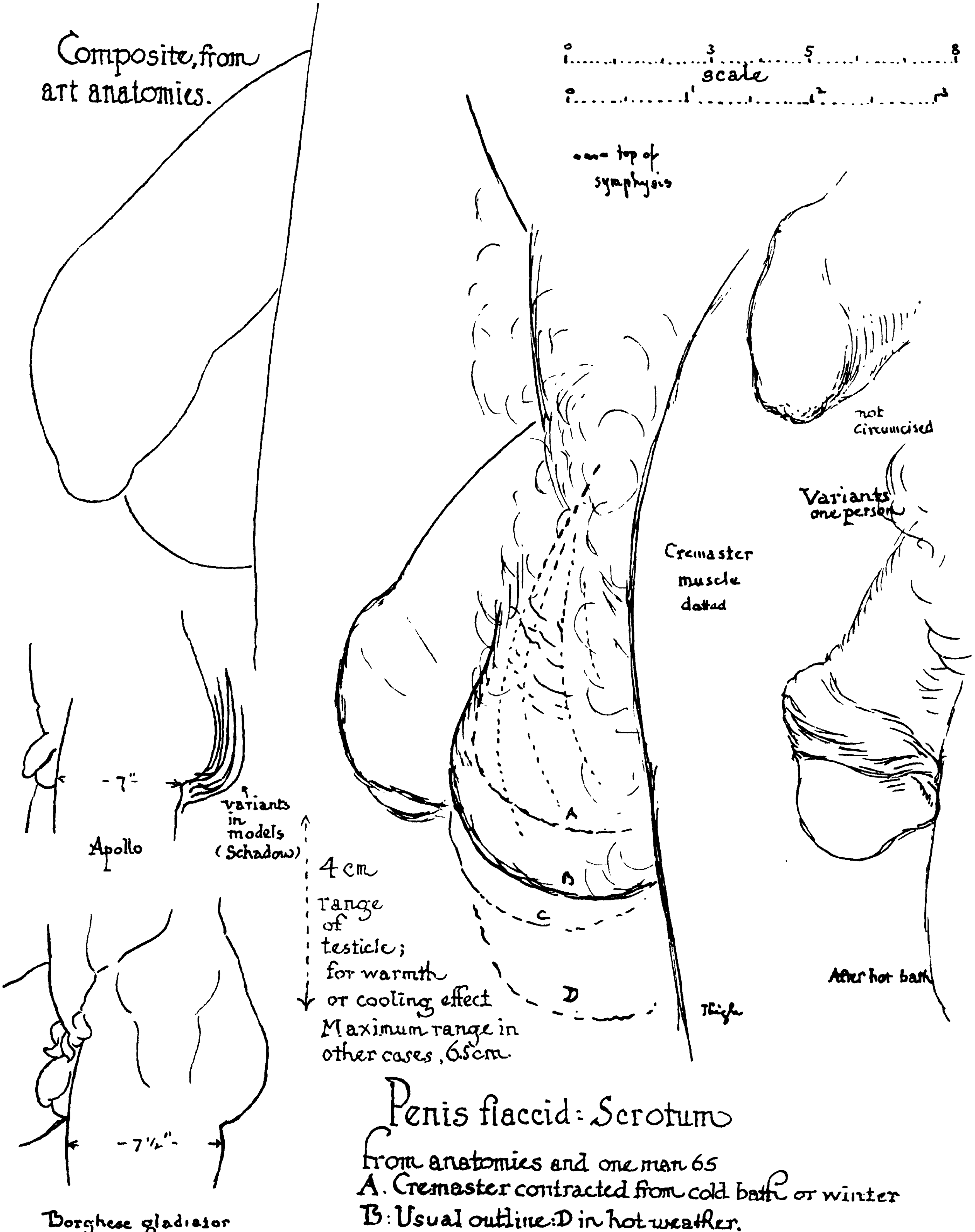
C. Corrosion specimen of right seminal vesicle and ampulla.

D. Longitudinal section of the seminal duct and its ampulla; of the vesicle and its duct; and the ejaculatory duct.

C & D = Life-size

Toldt, Anatomie.

Fig. 110



Penis flaccid: Scrotum

from anatomies and one man 65
A. Cremaster contracted from cold bath or winter
B: Usual outline: D in hot weather.
(Testis only functions at certain temperatures)

Fig. 111

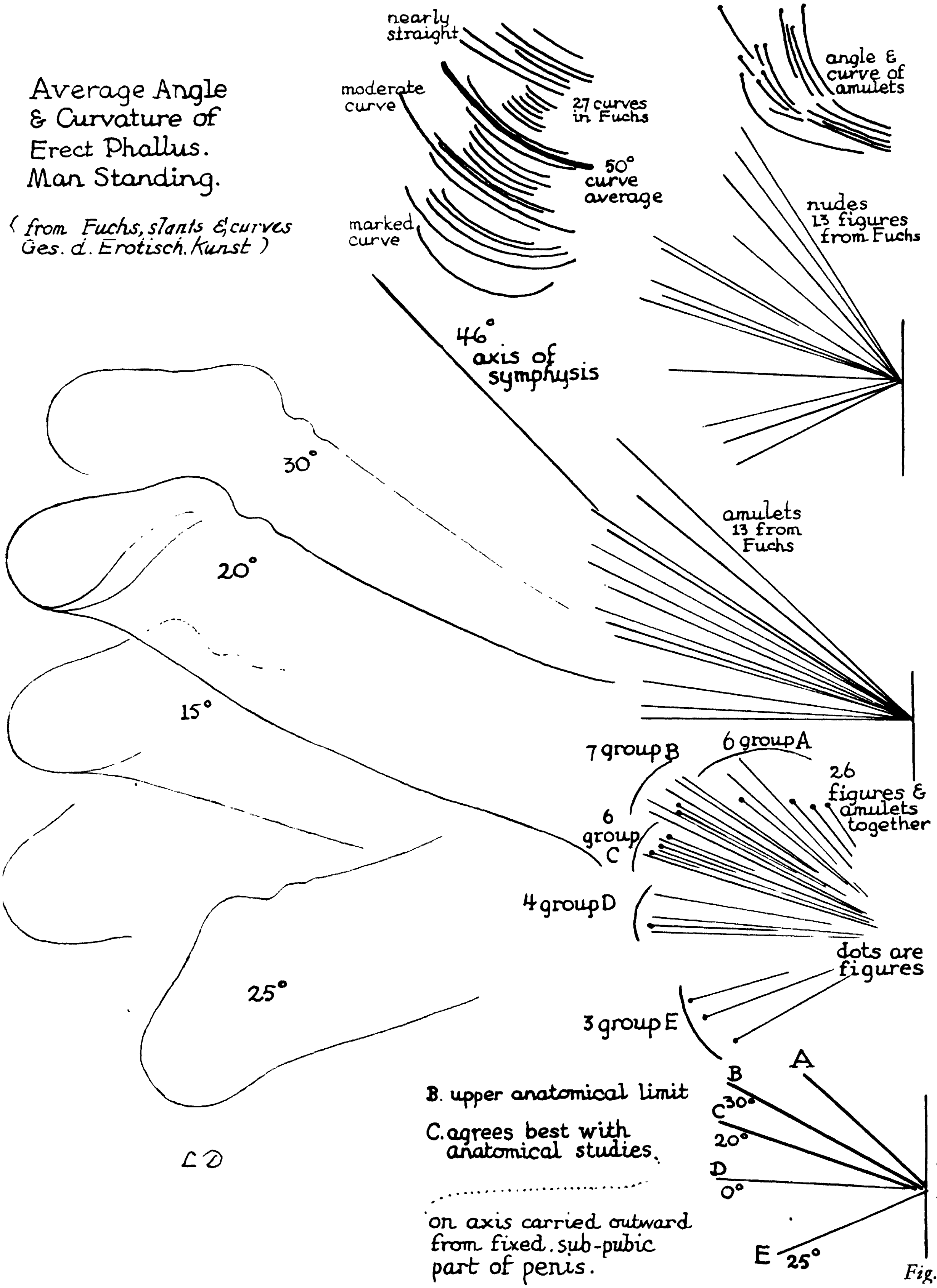
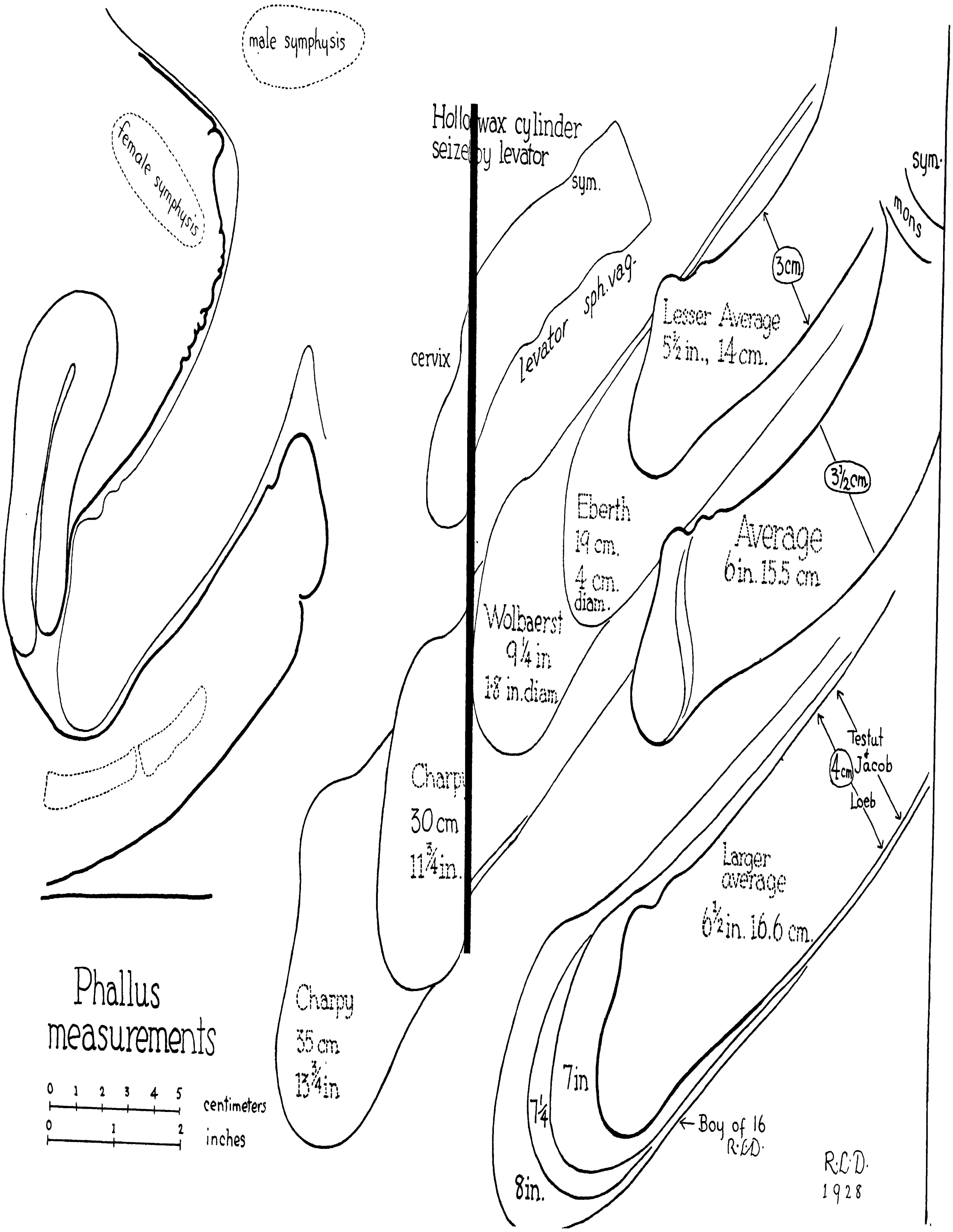
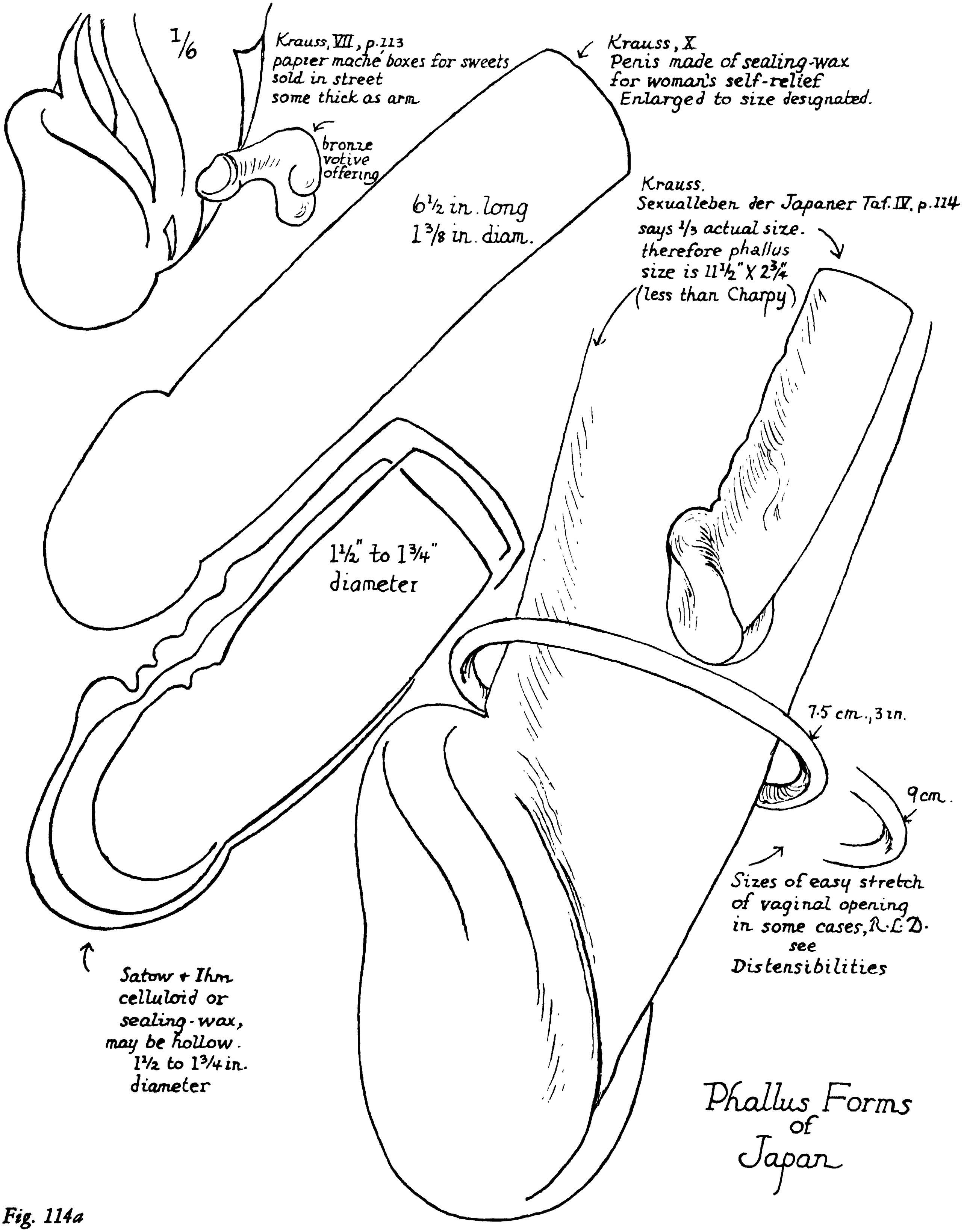

Average Angle & Curvature of Erect Phallus. Man Standing.
(from Fuchs, slants & curves Ges. d. Erotisch. Kunst)
nearly straight
moderate curve
27 curves in Fuchs
50° curve average
marked curve
angle & curve of amulets
nudes 13 figures from Fuchs
46° axis of symphysis
30°
20°
15°
25°
amulets 13 from Fuchs
7 group B
6 group A
26 figures & amulets together
6 group C
4 group D
dots are figures
3 group E
A
B
C 30°
20°
D
0°
E 25°
25° to 30°
B. upper anatomical limit
C. agrees best with anatomical studies.
on axis carried outward from fixed sub-pubic part of penis.
L D

Fig. 112



Phallus measurements

Fig. 113


1/6
6½ in. long
1⅜ in. diam.
1½" to 1¾" diameter
7·5 cm., 3 in.
9 cm.

Krauss, VII, p. 113
papier maché boxes for sweets
sold in street
some thick as arm

bronze
votive
offering

Krauss, X
Penis made of sealing-wax
for woman's self-relief
Enlarged to size designated.

Krauss.
Sexualleben der Japaner Taf. IV. p. 114
says ⅓ actual size.
therefore phallus
size is 11½" X 2¾"
(less than Charpy)

Sizes of easy stretch
of vaginal opening
in some cases, R. L. D.
see
Distensibilities

Satow + Ihm
celluloid or
sealing-wax,
may be hollow.
1½ to 1¾ in.
diameter

Phallus Forms
of
Japan

Fig. 114a

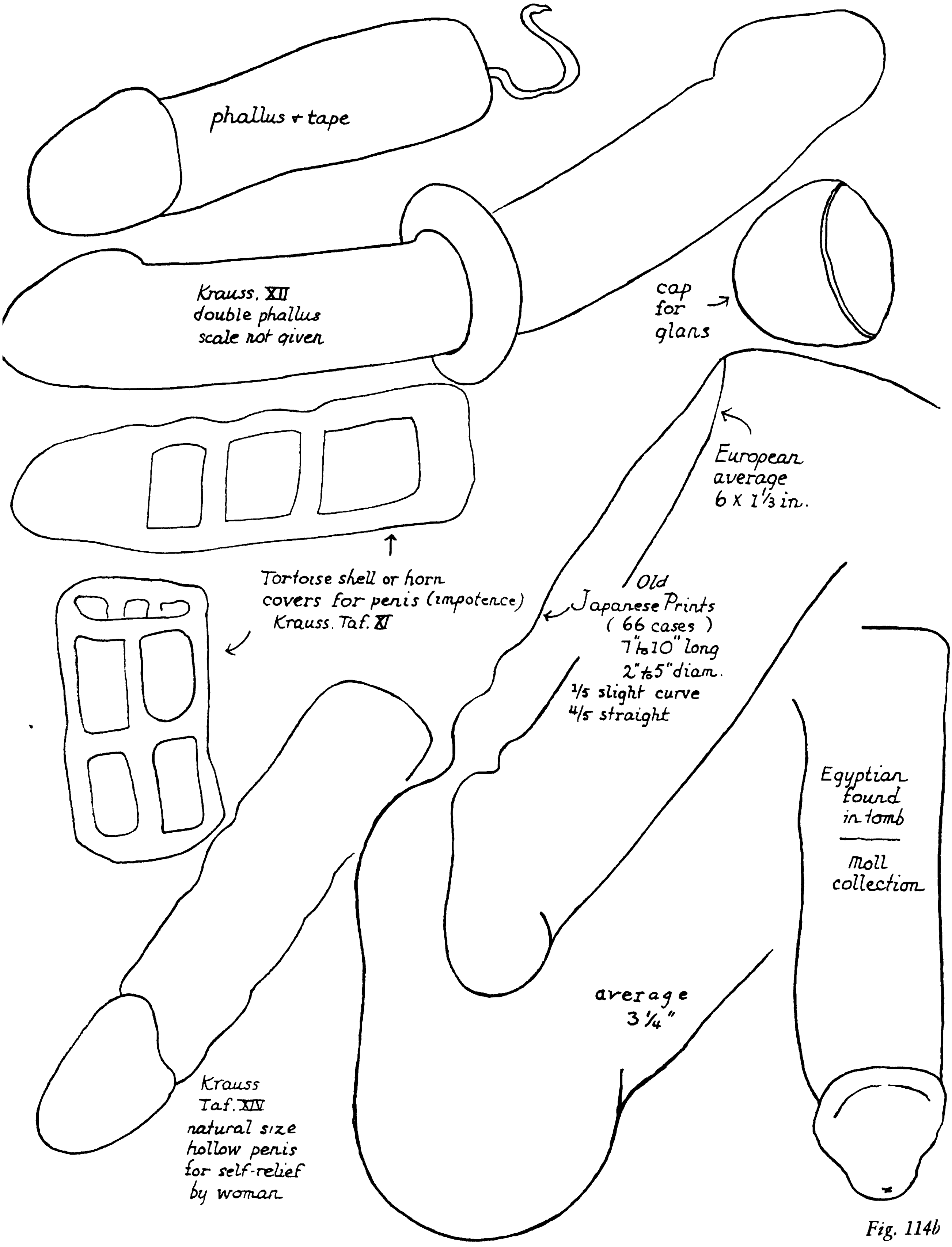

phallus & tape
Krauss. XII
double phallus
scale not given
cap
for
glans
European
average
6 x 1⅓ in.
Tortoise shell or horn
covers for penis (impotence)
Krauss. Taf. XI
Old
Japanese Prints
(66 cases)
7" to 10" long
2" to 5" diam.
1/5 slight curve
4/5 straight
Egyptian
found
in tomb
Moll
collection
average
3¼"
Krauss
Taf. XIV
natural size
hollow penis
for self-relief
by woman

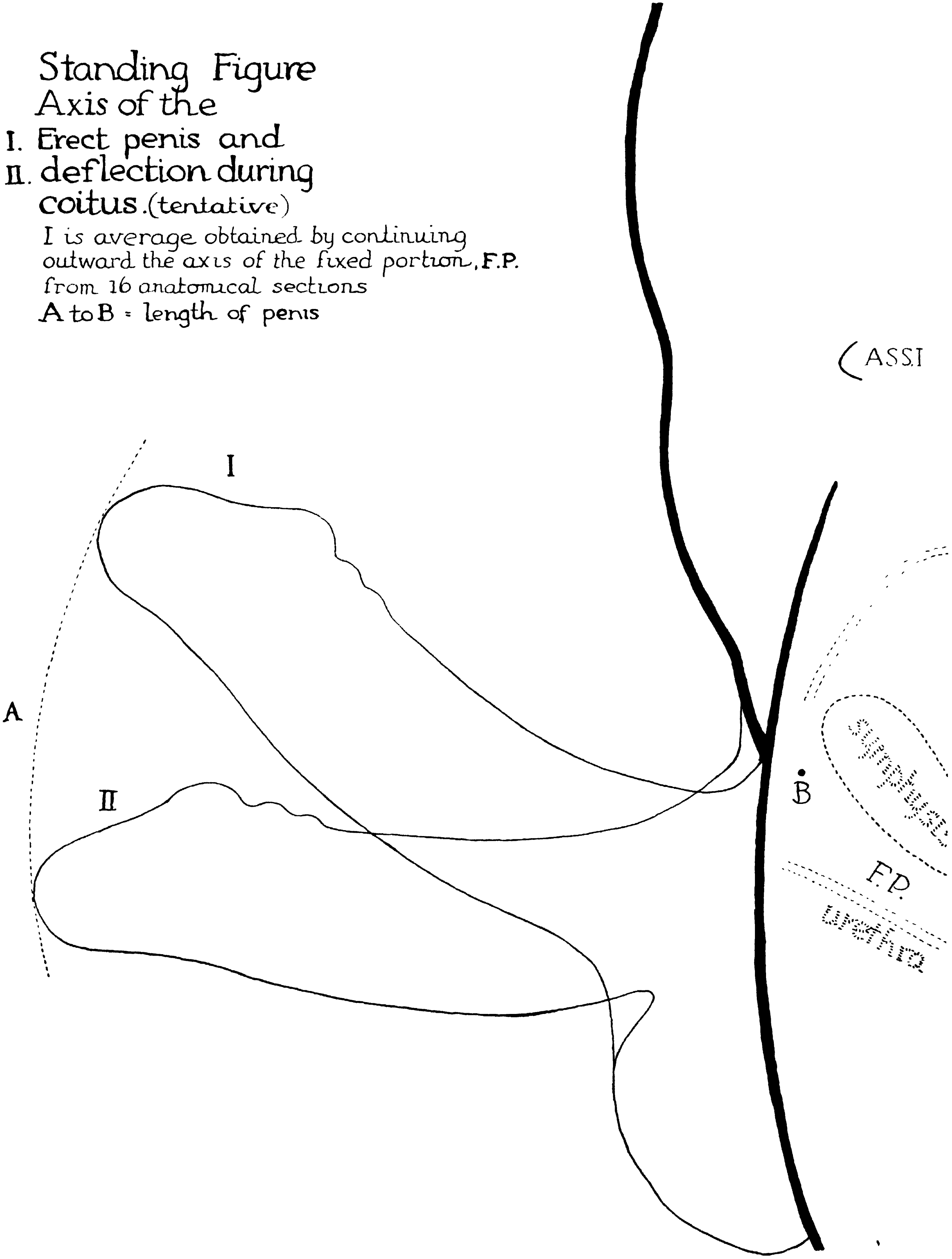
Fig. 114b

Standing Figure

Axis of the
I. Erect penis and
II. deflection during
coitus. (tentative)

I is average obtained by continuing outward the axis of the fixed portion, F.P. from 16 anatomical sections

A to B = length of penis



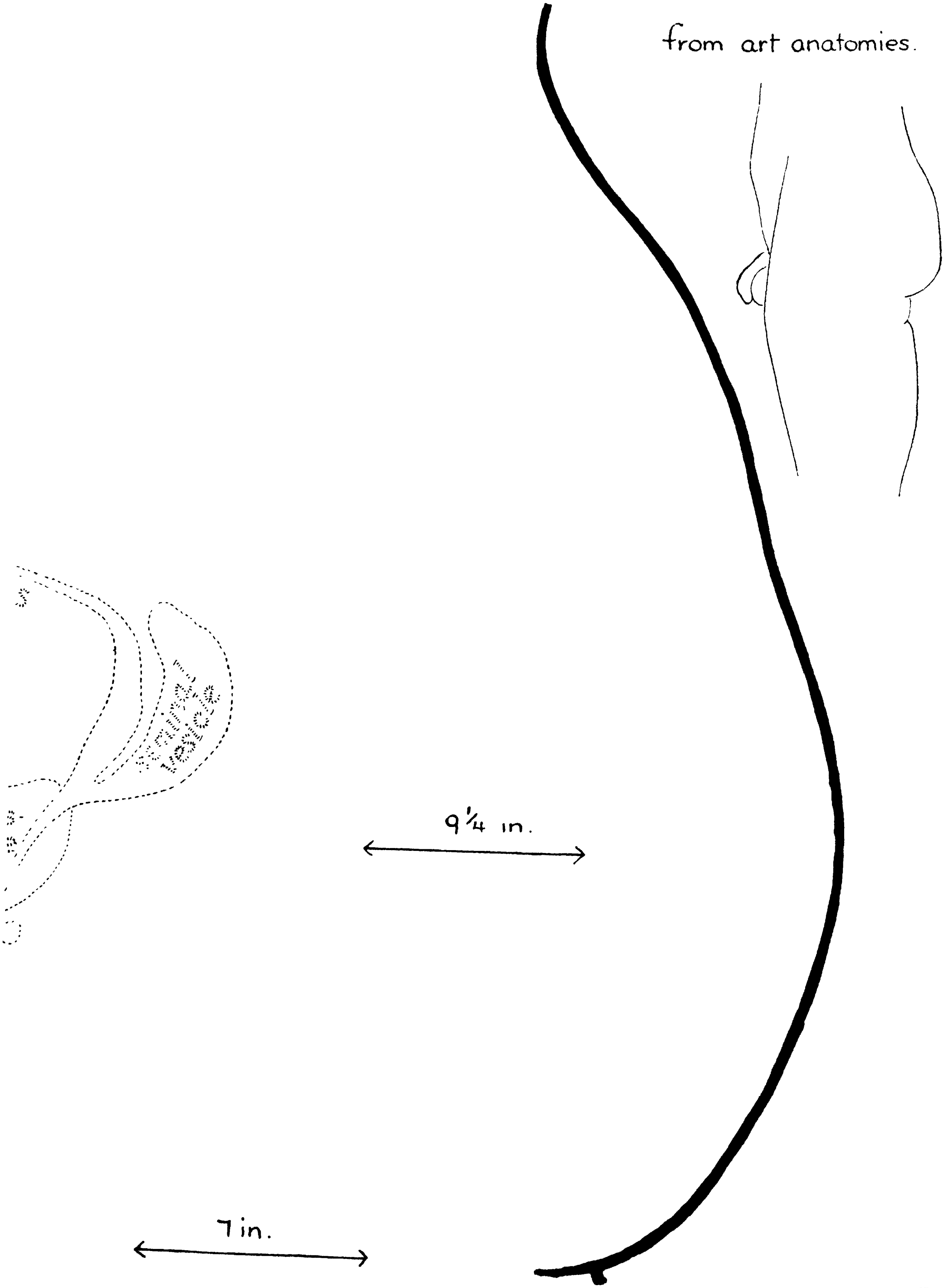
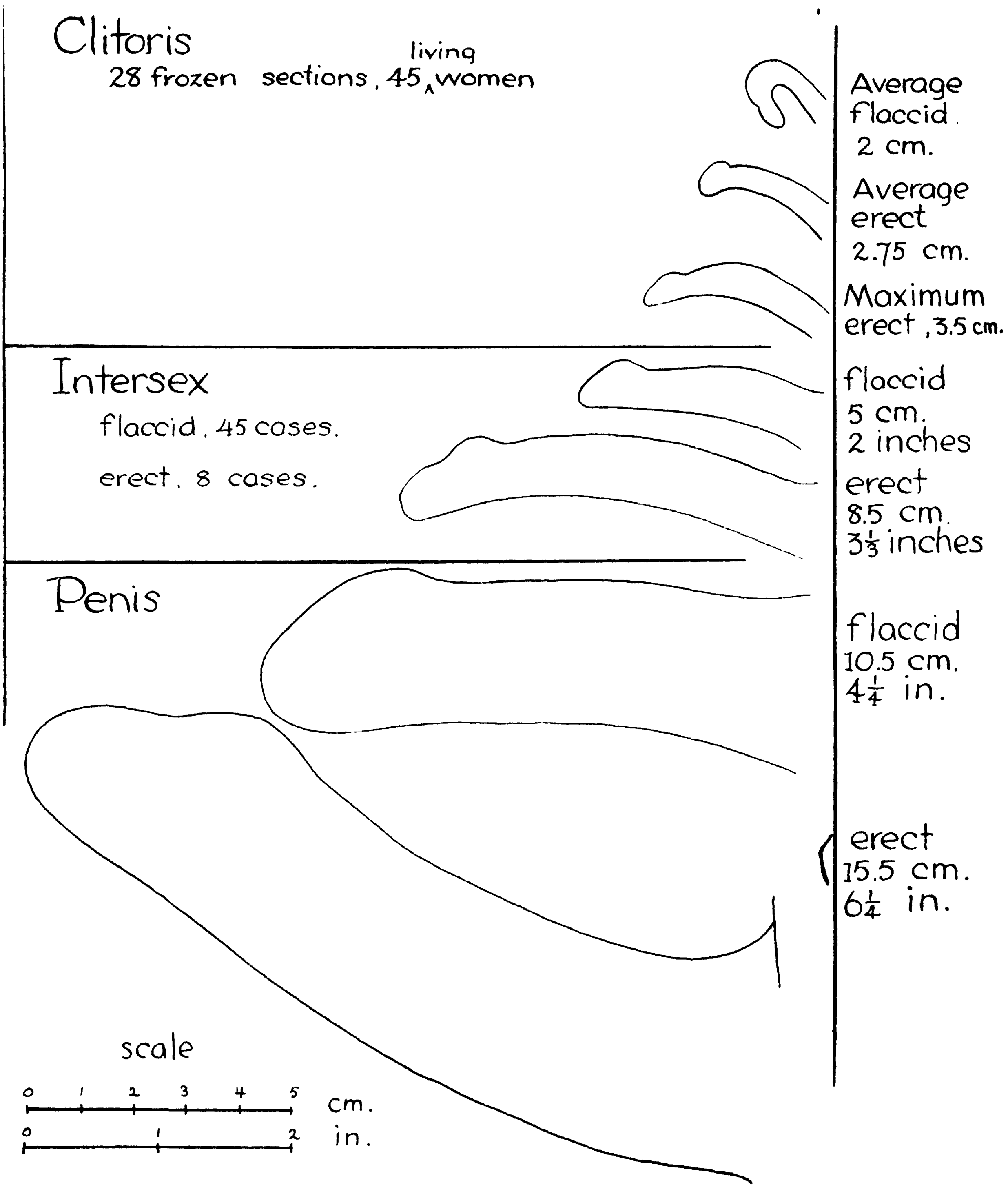
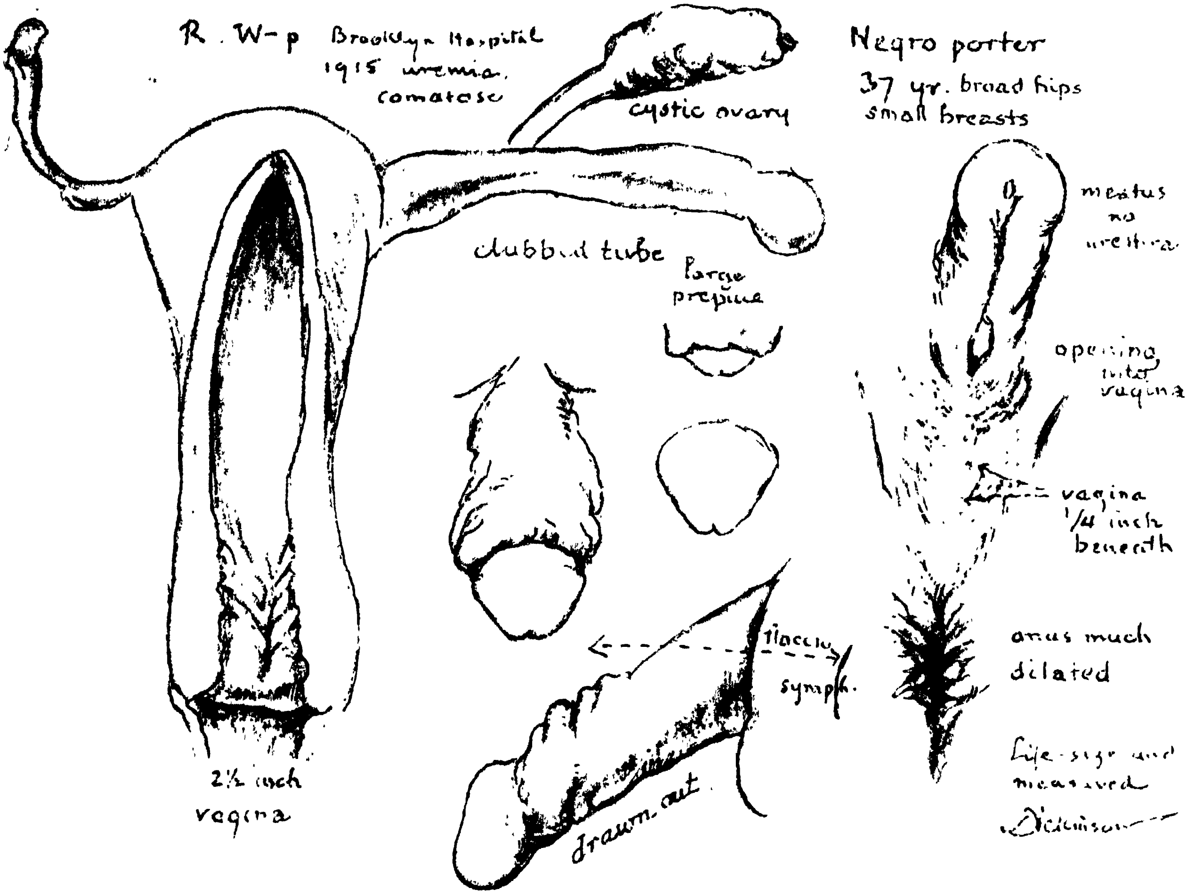


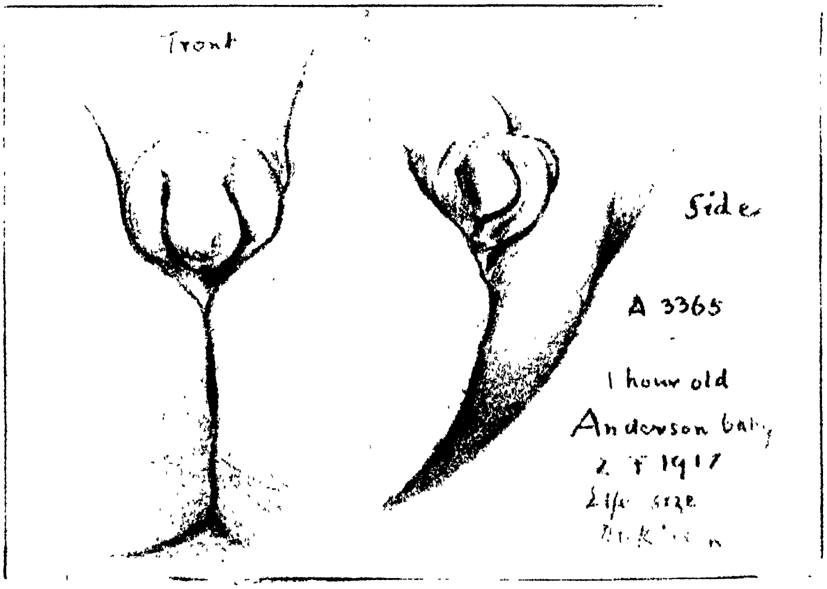
Fig. 115



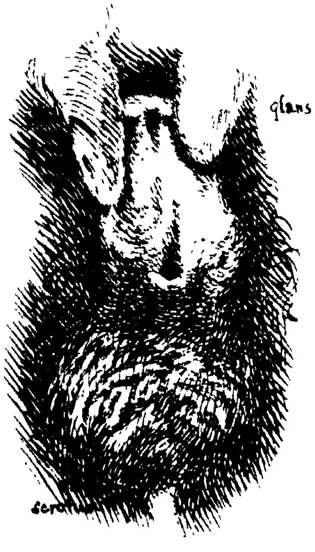
Copulator, female, male & intersex

Fig. 116





Intersex: resemblance to slit urethra



(Klaatsch) MALE ·
MIKA OPERATION ·
very small, dark photo
enlarged, copied
(Australian natives)

Fig. 117

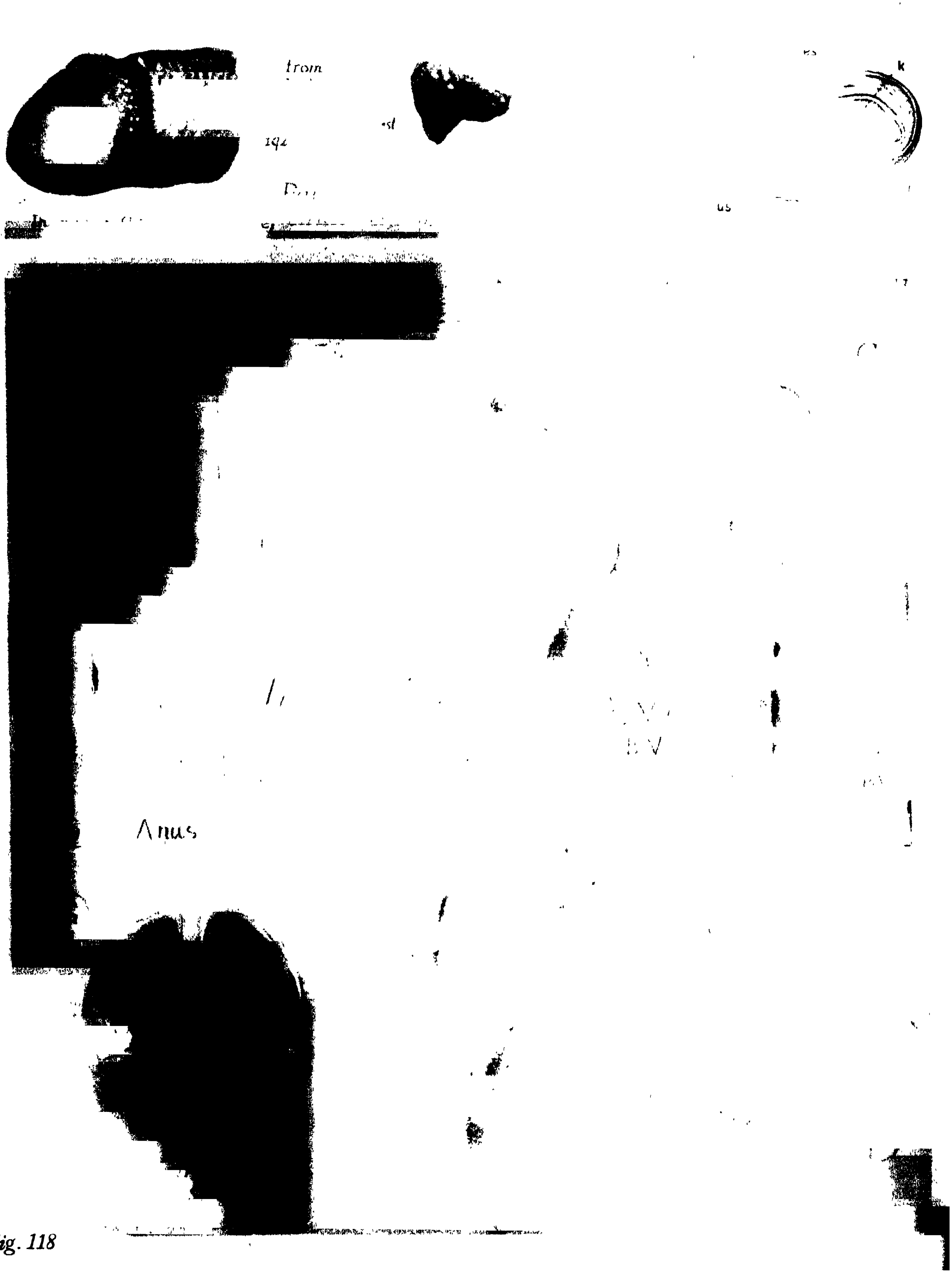


Fig. 118

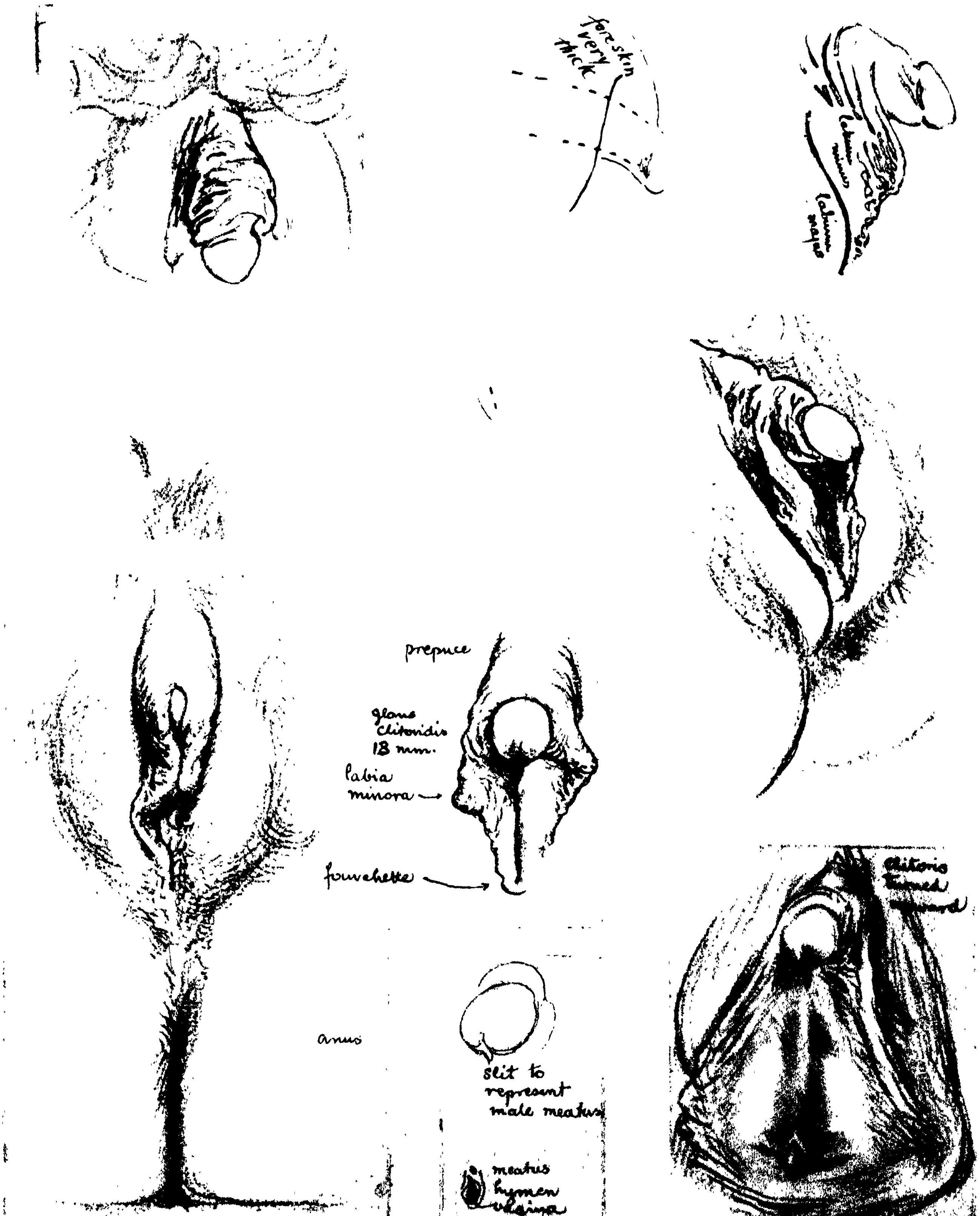
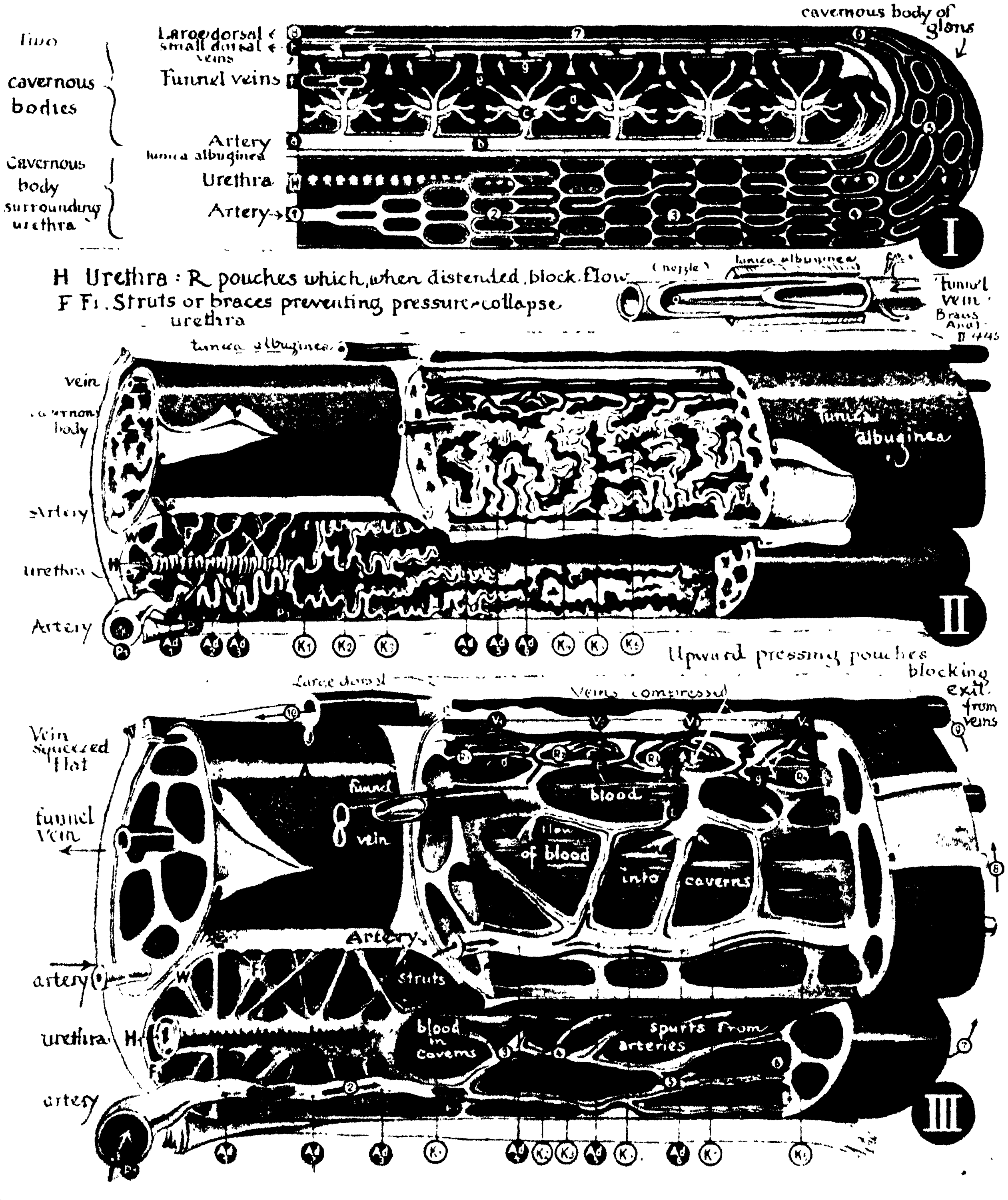

foreskin very thick
labium minus
labium majus
prepuce
glans clitoridis 18 mm.
labia minora
fourchette
anus
slit to represent male meatus
meatus
hymen
vagina
clitoris turned upward

Fig. 119

Diagram of Erection.

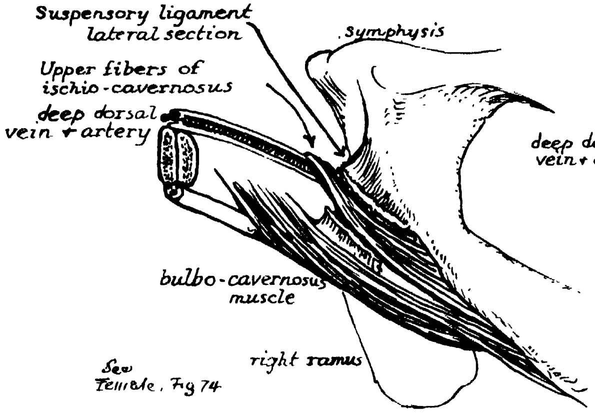
from Cahn Das Leben des Menschen 1931 · Stuttgart



H Urethra : R pouches which, when distended, block flow

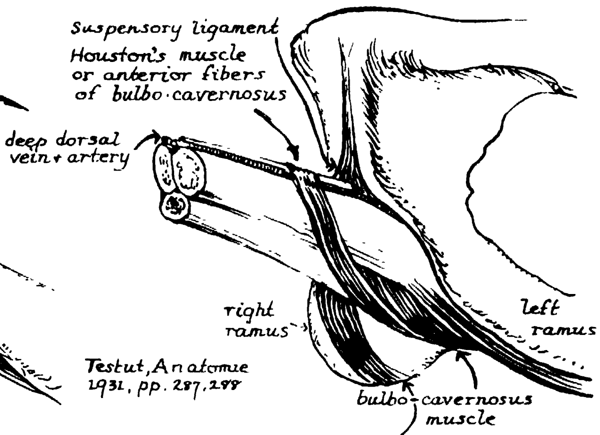
F F1. Struts or braces preventing pressure-collapse urethra

Fig. 120


Suspensory ligament lateral section
Symphysis
Upper fibers of ischio-cavernosus
deep dorsal vein + artery
bulbo-cavernosus muscle
right ramus

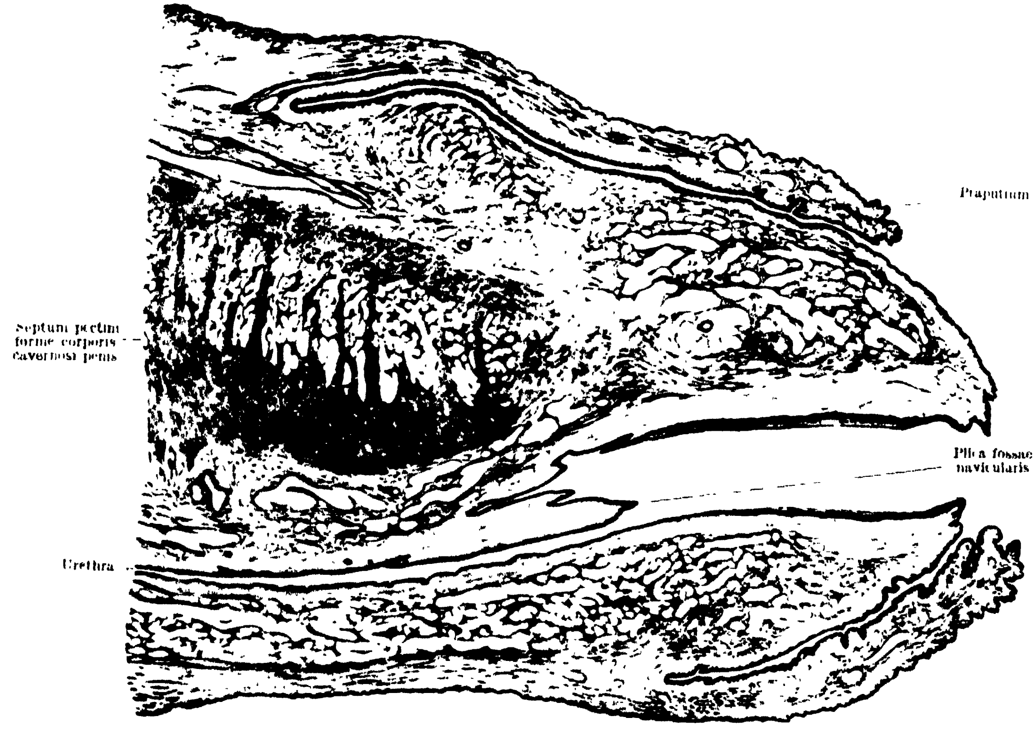
See Temele, Fig 74

Muscles that compress the dorsal vein of penis and the bulb to produce erection.


Suspensory ligament
Houston's muscle or anterior fibers of bulbo-cavernosus
deep dorsal vein + artery
right ramus
left ramus
bulbo-cavernosus muscle

Testut, Anatomie 1931, pp. 287, 288

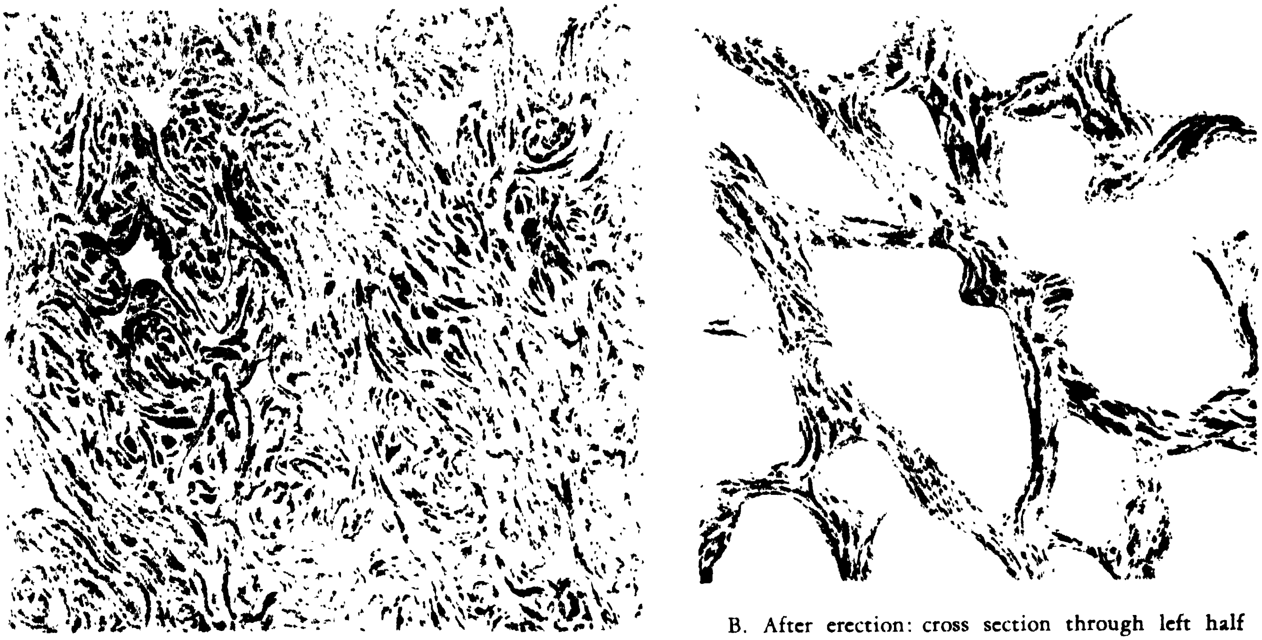
Left ischio-cavernosus covering root of left cavernous body.



Erection, simulated by injection, longitudinal section through glans penis of a 19-year old male. (× 3½) (Stieve *1*, p. 311)

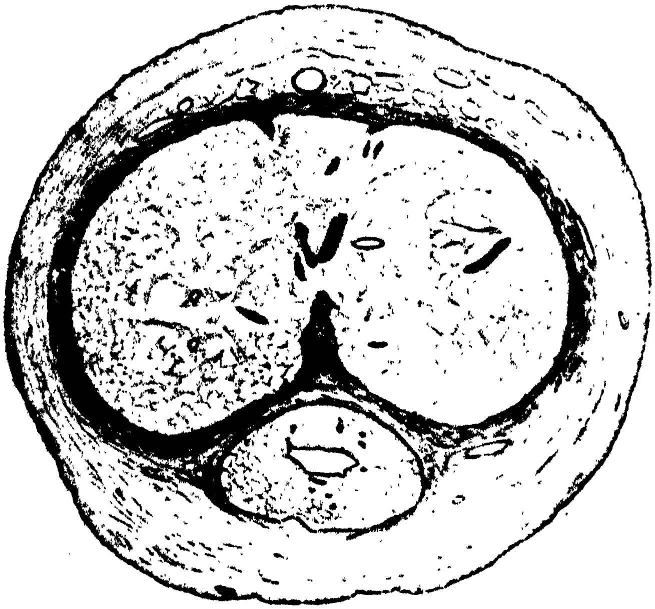
There is some puckering as noted on the surface of the glans for which reason the specimen probably fails to correspond to average measurements of penis.

Fig. 121



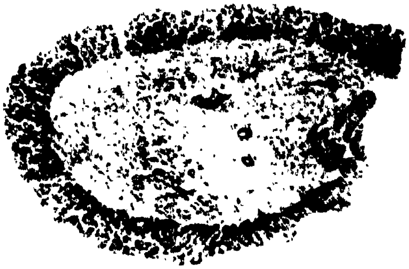
A. Before erection: section of right half of corpus cavernosum of 26-year old man. (× 6) The musculature is fully contracted and thereby the corpus cavernosum emptied. The tunica albuginea is relatively very thin. (Stieve *1*, p. 300)

B. After erection: cross section through left half of corpus cavernosum of a 23-year old man, injected with fixation fluid. (× 6) (Stieve *1*, p. 301, 300)

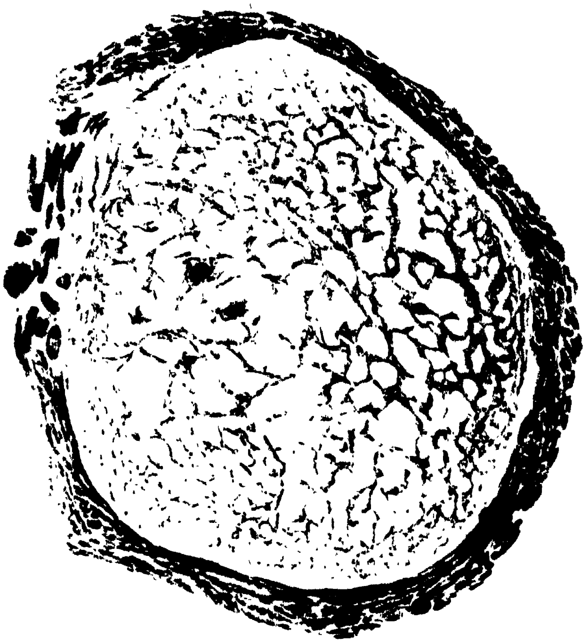


C. Erection: cross section through outer end of urethral corpus cavernosum and glans, just before the tip of the corpus cavernosum of the penis of 21-year old man. From same specimen as shown in Figure 123:C. (Stieve *1*, p. 310)

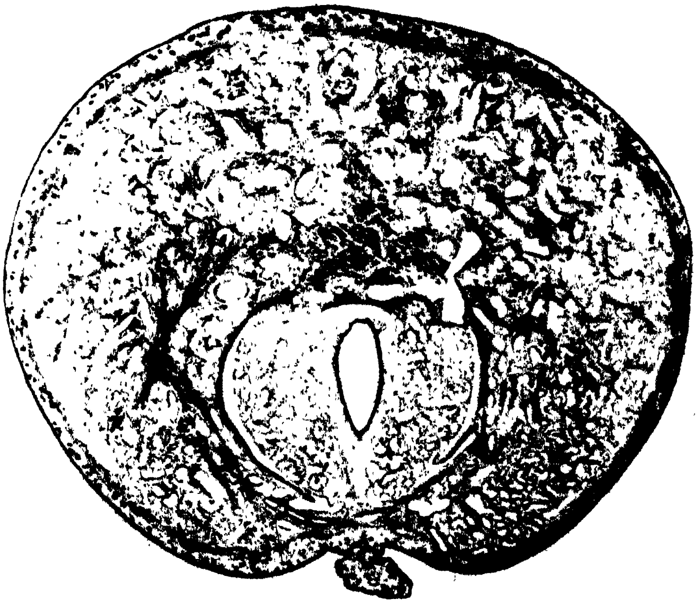
Fig. 122



A Before erection: collapsed and empty caverns; connective tissue from the flaccid corpus cavernosum of a 32-year old man, fixed in formalin. (× 40) (Stieve *1*, p. 302)



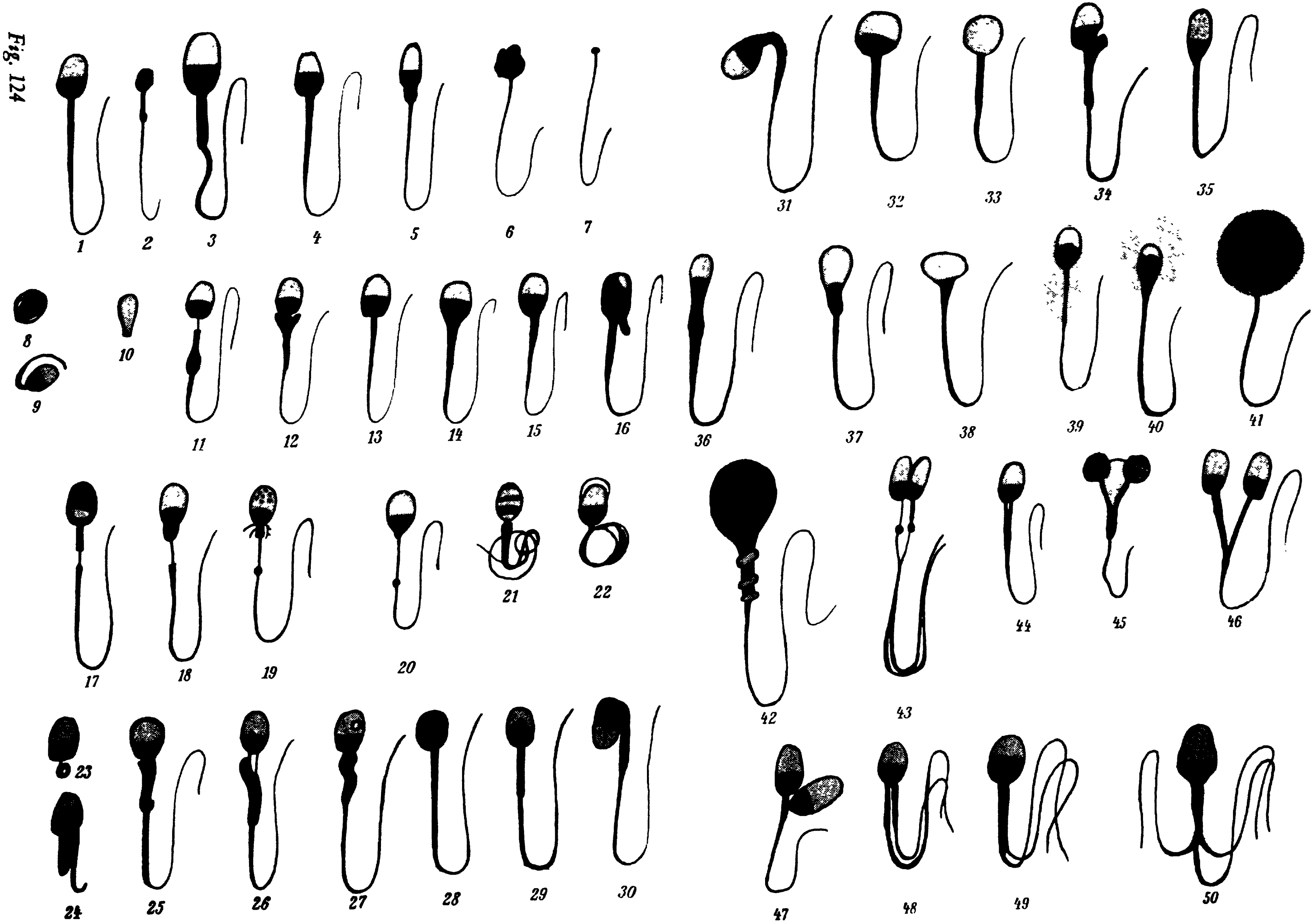
B. After erection: with caverns distended; cross section through the same part of the corpus cavernosum of a 23-year old man, fully distended with fluid, fixed in formalin. (× 40) (Stieve *1*, p. 303)



C. Erection: cross section through the free end of the penis of a 21-year old man. From same specimens as in 122:C. The whole penis was injected and hardened in full erection and imbedded in celloidin. (× 3½) (Stieve *1*, p. 301)

Fig. 123

Fig. 124



Spermatozoa of various forms enlarged about 2000 times
G. L. Moench Studien zur Sterilität; also Am. Jl. O. & G. 1931, p 199

Fig. 124. SPERMATOZOA OF VARIOUS FORMS

(*From Moench, Studien zur Fertilität*)

1. Normal spermatozoon.

2. Microsperm.

3. Megalosperm. End fibril of tail well pronounced in this specimen.

4. Roughened head membrane.

5. Narrow cell with spheroidal swelling of body.

6. Irregularly solid staining head and absence of body.

7. Aplastic head and absence of body. Such cells have been seen motile

8. Arrested development of germ cell—tail tightly coiled about head, head solid staining.

9 Arrested development of tail.

10. Phantom cell, takes almost no stain, head tapers posteriorly, due to lack of division of end knobs, no body or tail

11. Filiform middle piece and spheroidal swelling of posterior end of body.

12 Cytoplasmic extrusion, pseudo-swelling of head

13 Overdevelopment of end knobs, posterior end of head square.

14. Body tapers, broader anteriorly—form of cytoplasmic extrusion. Of no clinical significance.

15. Abaxial implantation of body and tail.

16. Abaxial implantation of body and tail. Cell originally double bodied and stump of second body still present Oblique tear or separation of head membrane.

17. Separation of body (probably artefact) Reverse staining of head, anterior portion darkest The thick line running along the base of the head is found at times. Whether it represents an overdeveloped end knob or a remnant of the blepharoblast or cytoplasm is somewhat in doubt but from our microdissection studies we tend to the last possibility.

18. Separation of body, perhaps the thickening in the anterior portion is due to a drawing up of the body by the elastic fibers present here, or the anterior or posterior end knob or both end knobs may be overdeveloped

19 Short fibrils seen around abnormal body. Elastic fibrils? Thickened end ring The cell head also shows fine stippling which is occasionally met with. It apparently indicates a beginning degeneration of the head covering See also *21*, *28* and *29*.

20 Thickened end knob and end ring Naked body fibril

21. Coiled tail which is of no significance and undoubtedly an artefact In addition we have here cross lines on the head which are not to be confused with Valentine's cross bands and represent either artefacts or degeneration. This cell also shows a narrowed neck which probably does not represent a separation of the anterior or posterior end knobs, as I have seen this picture especially in slides not made by myself and more or less roughly handled.

22 Cell with coiled tail, may be an artefact or may be an actual change in the cell. At any rate, it is a late change and of relatively little significance. Such cells have been seen motile, although their motility is of necessity limited In addition this cell head shows an apparent head cap but whether this is really a head cap such as is found in the case of the guinea pig or a separation of the head membrane is still under investigation.

23 Coiled undeveloped tail This is important as the cell has nothing to propel it

24 Tail folded up, artefact.

25 This cell shows a nick in the body and a little piece similar in size and shape, but upside down, attached to the opposite side of the body. It would seem as if this body had been tightly coiled and in straightening out had torn a piece out of the body. Williams and Savage have seen some specimens of semen from the bull in which a fair number of the cells showed such a nick in the body with a small piece similar in size and shape to the nick attached to the tail of the cell. Cell *25* also shows the thickening of the anterior head membrane seen in some cells.

26 This probably represents a splitting loose of the sheath of the body

27 Crooked thickened body. In the head a little refracting area whose significance is unknown Polar body? Centrosome? Plasmosome? Artefact?

28 Several dark areas at the demarcation of the light and dark areas of the head. Rents in the head capsule?

29 Apparently a splitting of the capsule.

30, 31 These forms are not artefacts. They have been seen motile in the fresh specimen, and do not straighten out They often move sideways, backwards, or in circles (see text).

32 Rounded cell head with overdeveloped anterior end knob Moderately rounded heads are probably normal variations and of no clinical significance unless they show other abnormalities as in cell *33*, where staining reaction is abnormal and the cell therefore probably inferior.

34 Cell head with apparently a piece of the cell membrane of the base broken out. Due to trauma?

35 Frequently seen form of tapering head. Significant when present in large numbers in any one sample of semen.

36 Exaggerated narrow and tapering cell with spheroidal swelling around base; overdeveloped end knobs? This form of head must be separated from spheroidal swellings of the cell body in this region.

37 Tapering cell, nuclear material diminished. These cells easily separate from the body.

38 Extreme form of tapering cell.

39 Immature cell, cytoplasm of cell not cast off; no body. Nucleus (sperm head) has moved to anterior portion of cell. Such cells are occasionally seen, as also cell *40*, which likewise represents an immature cell which has failed to cast off its cytoplasm, the nucleus (head) not even having moved to the anterior portion of the cell.

41 Puff ball type of cell, contour washed out; short tail; no body. This form of cell, representing an immature abnormally developed cell, has been seen in the fresh specimen, but often is an artefact and produced by allowing the cells to dry slowly in a moist heat. Rapid drying in the flame will prevent such puffing or disintegration of the cells.

42 Large immature cell-spiral fibers about the body, or cytoplasmic discs?

43 Double form showing in each cell the same abnormalities, namely a narrow head, naked body fibril, and thickened end ring. Double forms are at times only apparent or artefacts, but in other cases double forms are actually present, especially the megalosperms showing a tendency to double bodies and tails. Even two separate sperms stuck together must have a significance since they frequently, as in this case, show the same abnormalities, indicating disturbed spermatogenesis and lack of complete separation (see also text).

44 Double neck.

45 Double sperm, immature, spermatic veil over and between heads, swelling of body.

46 Double head and body

47. Double heads, one almost without body.

48 Single head, double body and tail.

49. Single head, single thickened body, double tail.

50 Single head, single thickened body, triple tail.

CHAPTER VII

THE ANATOMY OF COITUS

Text and commentary pages 84 to 109
Figures 125 to 159

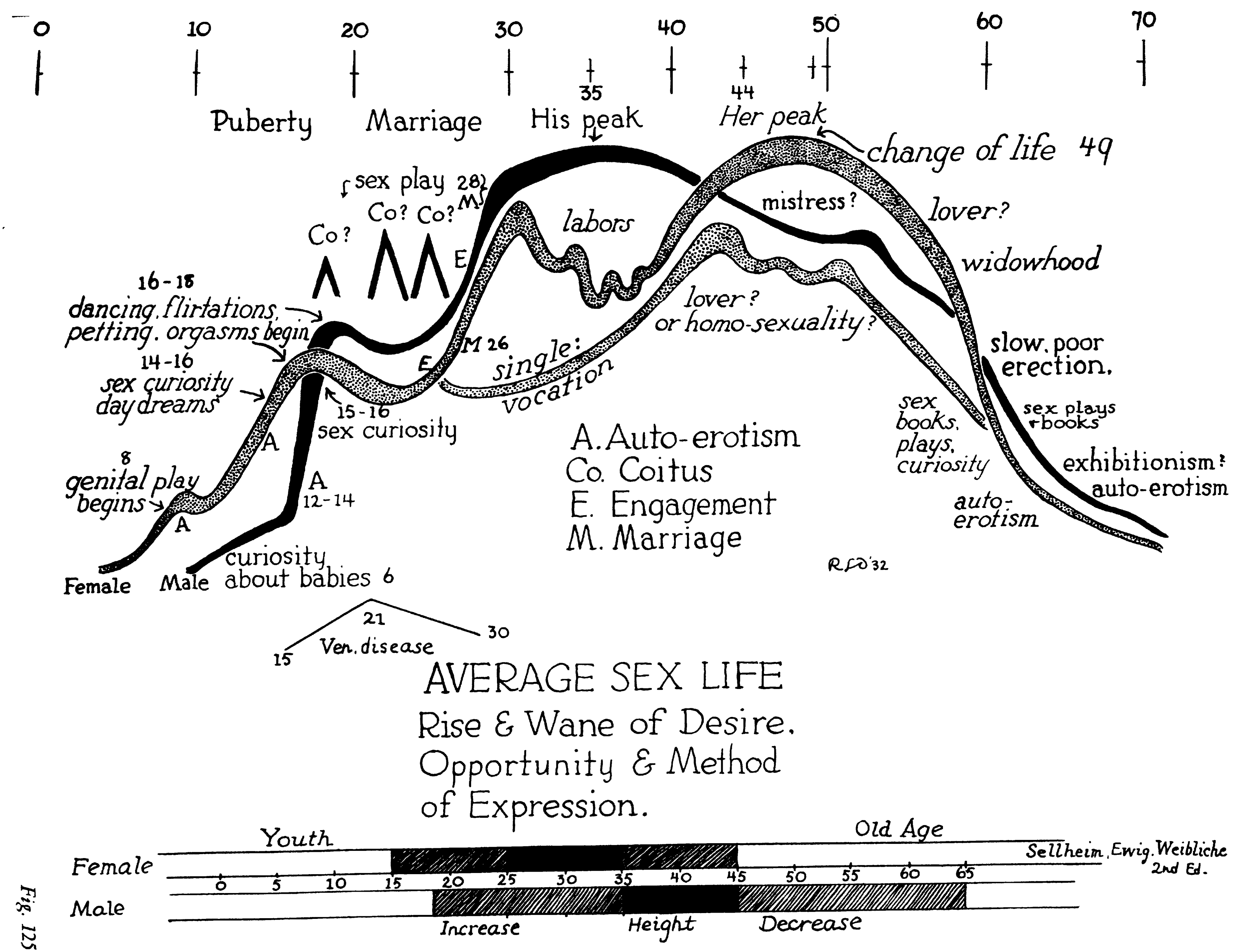
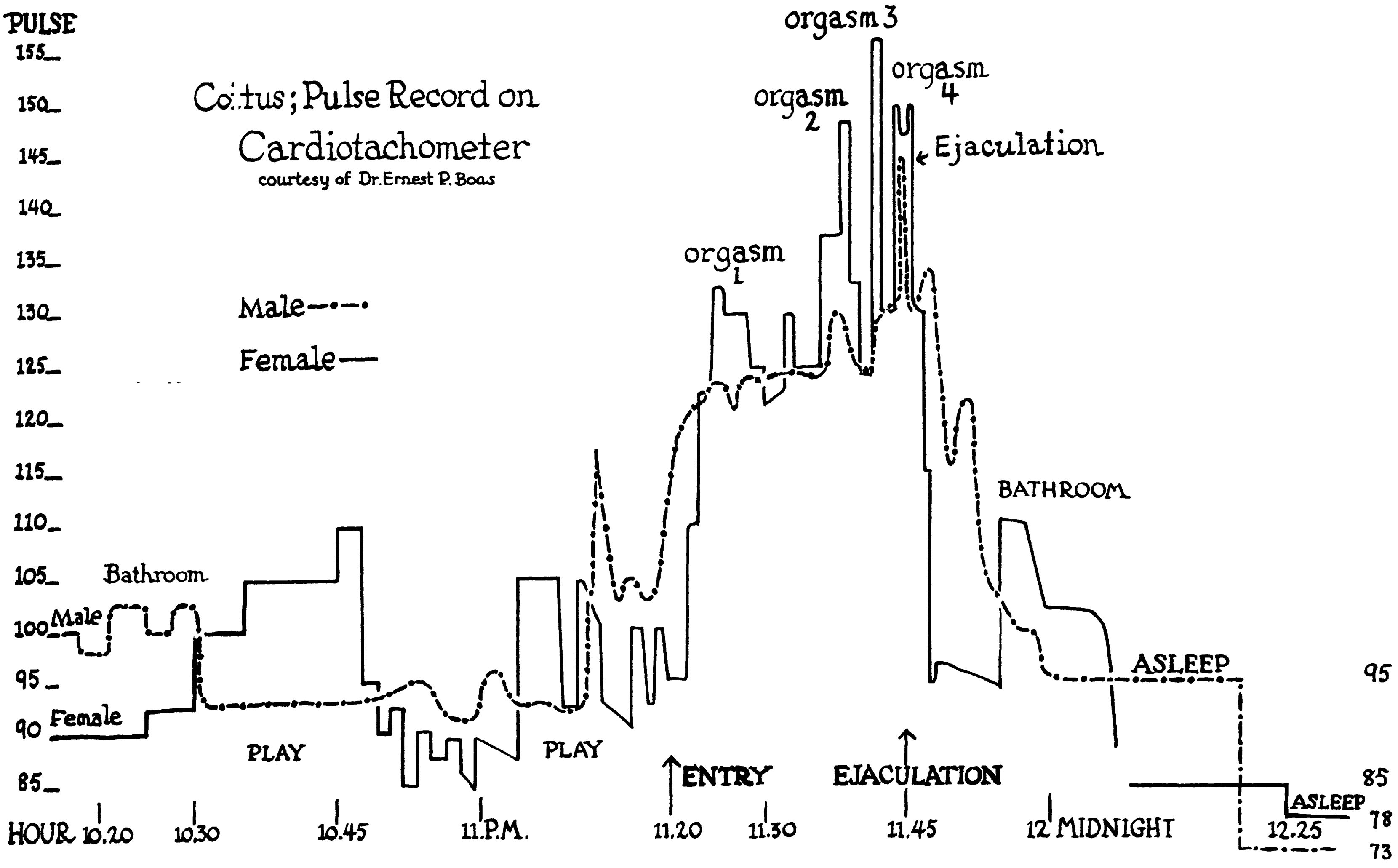

0
10
20
30
35
40
44
50
60
70
Puberty
Marriage
His peak
Her peak
change of life 49
sex play 28
Co?
Co? Co?
M
E
labors
mistress?
lover?
widowhood
16-18
dancing, flirtations, petting. orgasms begin
14-16
sex curiosity day dreams
E
M 26
single: vocation
lover? or homo-sexuality?
slow, poor erection.
15-16
sex curiosity
A
8
genital play begins
A
A
12-14
sex books, plays, curiosity
sex plays + books
exhibitionism?
auto-erotism
auto-erotism
A. Auto-erotism
Co. Coitus
E. Engagement
M. Marriage
R.L.D. '32
Female
Male
curiosity about babies 6
21
30
15
Ven. disease
AVERAGE SEX LIFE
Rise & Wane of Desire.
Opportunity & Method of Expression.
Youth
Old Age
Female
Male
0
5
10
15
20
25
30
35
40
45
50
55
60
65
Sellheim, Ewig. Weibliche 2nd Ed.
Increase
Height
Decrease

Fig. 125

Fig. 126


Coitus; Pulse Record on
Cardiotachometer
courtesy of Dr. Ernest P. Boas
Male
Female
PULSE
155
150
145
140
135
130
125
120
115
110
105
100
95
90
85
HOUR
10.20
10.30
10.45
11 P.M.
11.20
11.30
11.45
12 MIDNIGHT
12.25
Bathroom
Male
Female
PLAY
PLAY
ENTRY
EJACULATION
orgasm 1
orgasm 2
orgasm 3
orgasm 4
Ejaculation
BATHROOM
ASLEEP
ASLEEP
95
85
78
73

COITUS REPORTED	526 COUPLES NUMBER	PER CENT OF TOTAL
DAILY OR OFTENER	82	16
WEEKLY	317	60
TWICE OR THREE TIMES WEEKLY	124	23
ONCE OR TWICE A WEEK	103	20
ONCE A WEEK	90	17
LESS THAN WEEKLY	127	24
FORTNIGHTLY TO MONTHLY	55	10
ONCE IN MONTH TO SIX MONTHS	14	3
ONCE A YEAR OR LESS	58	11

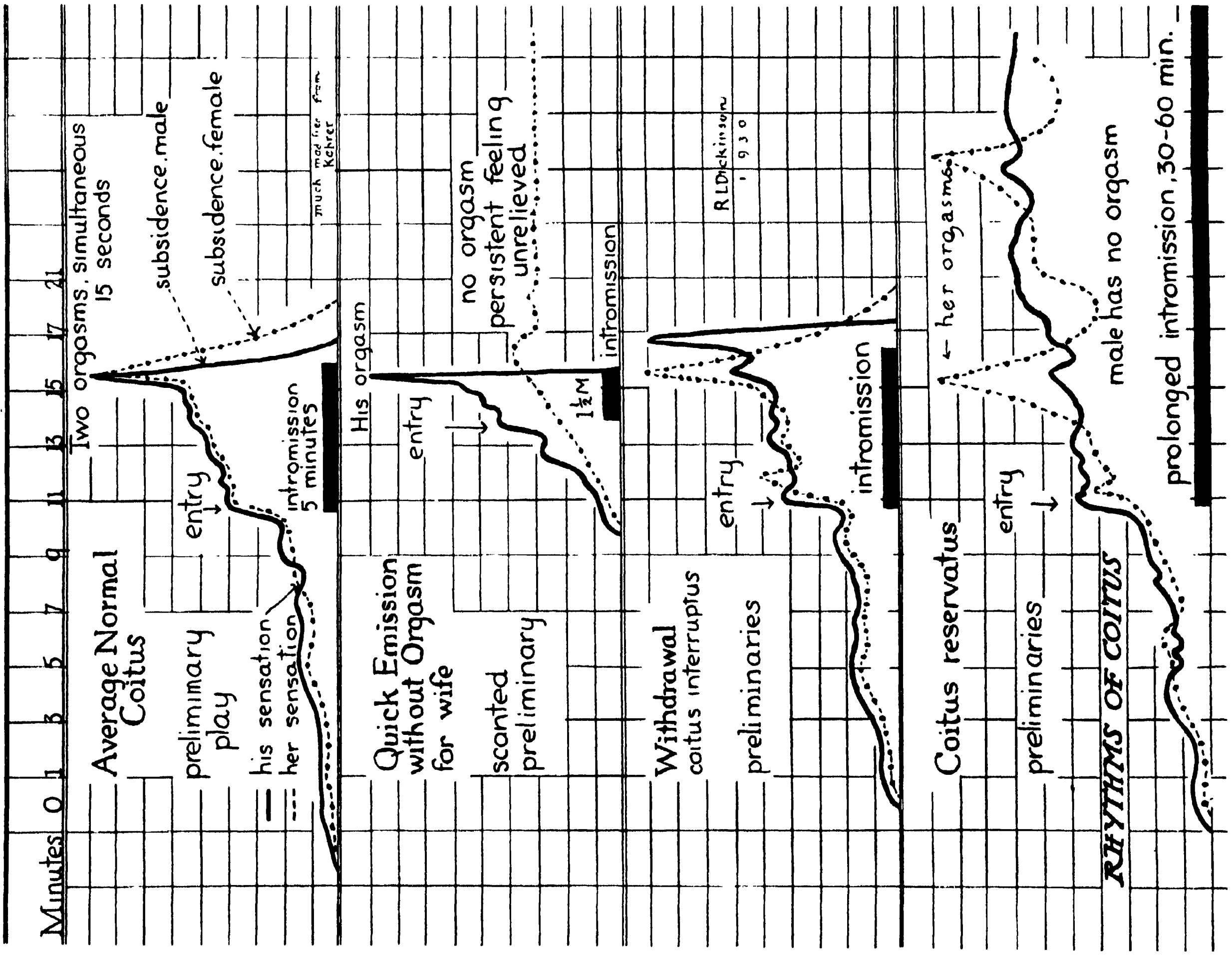


Fig. 1

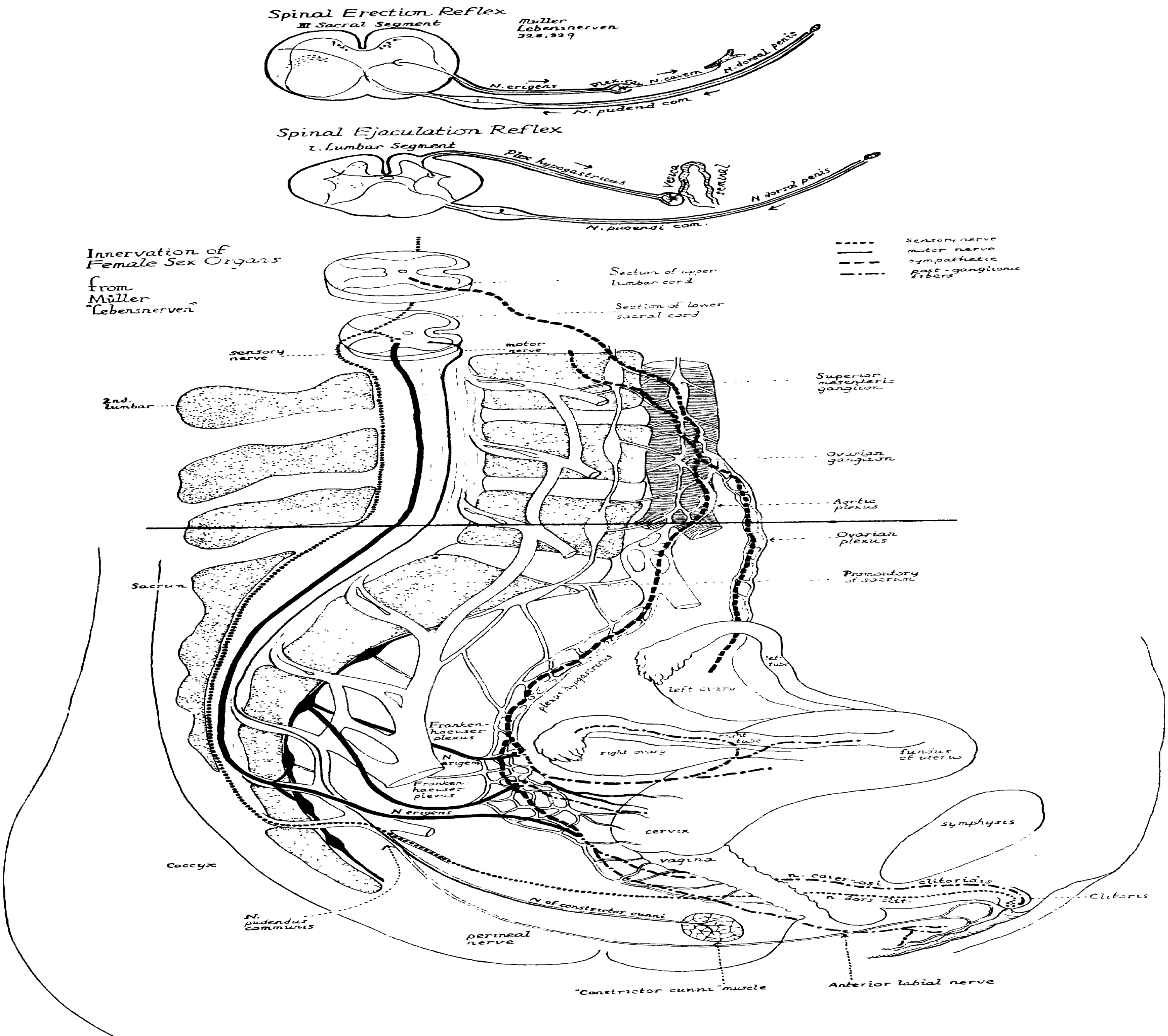
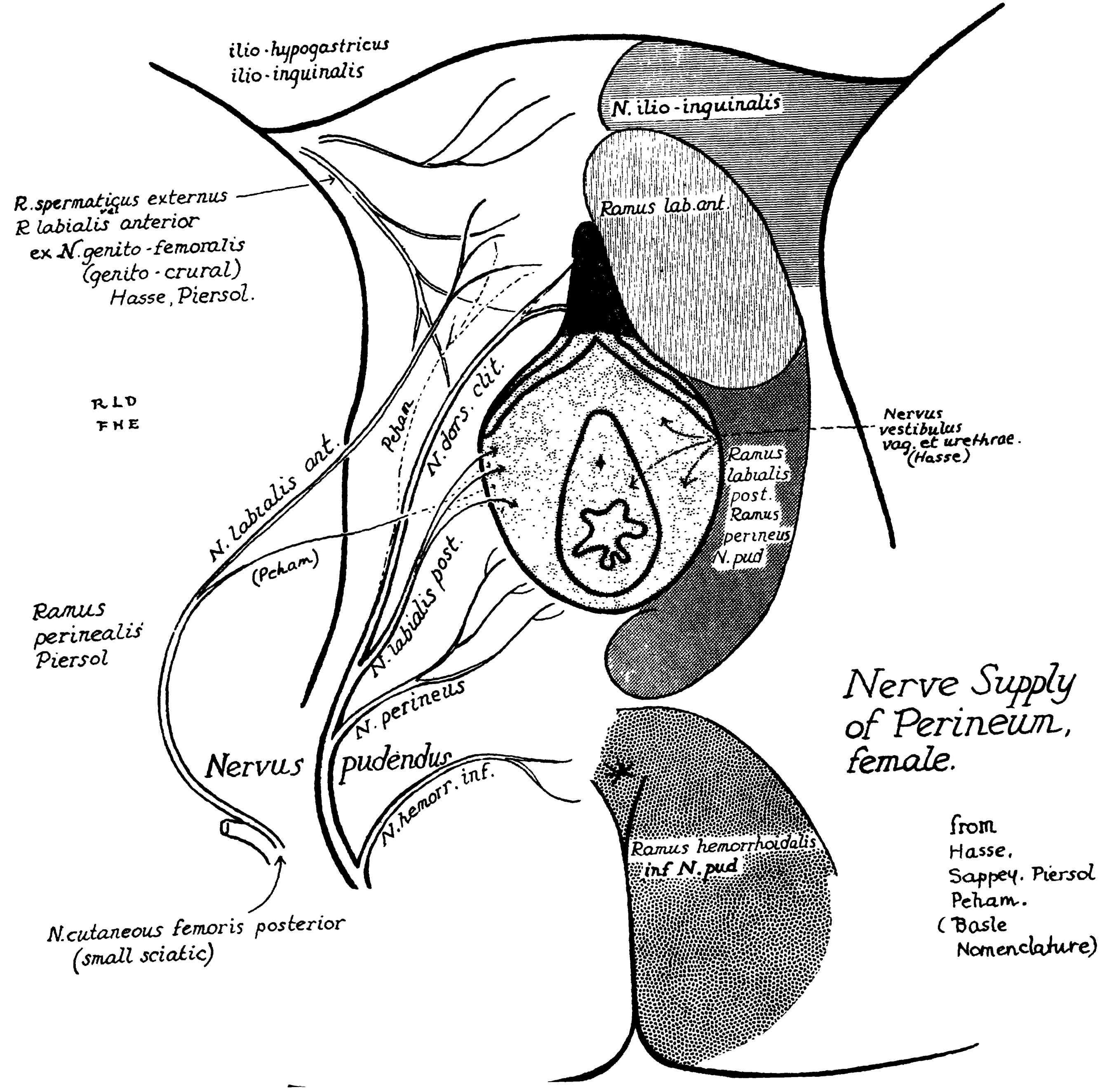
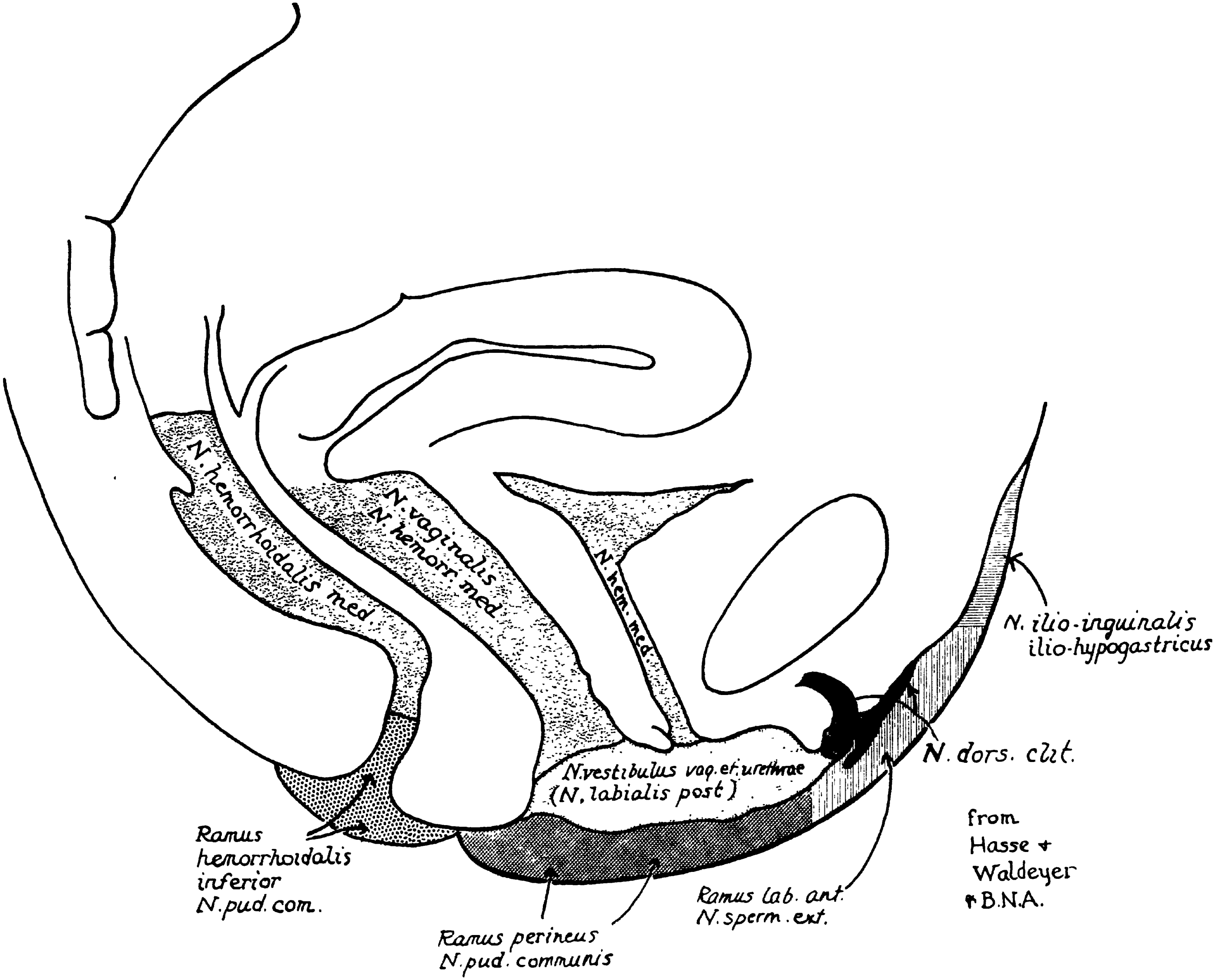

Spinal Erection Reflex
III Sacral Segment
Müller Lebensnerven 328, 329
N. erigens
Plex. cav.
N. cavern
N. dorsal penis
N. pudend com
Spinal Ejaculation Reflex
1. Lumbar Segment
Plex hypogastricus
Vesica
seminal
N dorsal penis
N. pudendi com.
Innervation of Female Sex Organs
from Müller "Lebensnerven"
sensory nerve
motor nerve
sympathetic
post-ganglionic fibers
Section of upper lumbar cord
Section of lower sacral cord
sensory nerve
motor nerve
2nd. lumbar
Superior mesenteric ganglion
Ovarian ganglion
Aortic plexus
Ovarian plexus
Promontory of sacrum
Sacrum
left tube
left ovary
plexus hypogastricus
Frankenhaeuser plexus
N erigens
Frankenhaeuser plexus
right ovary
right tube
fundus of uterus
N erigens
cervix
symphysis
vagina
n. cavernosi clitoridis
n dors clit.
Clitoris
Coccyx
N of constrictor cunni
N. pudendus communis
perineal nerve
"Constrictor cunni" muscle
Anterior labial nerve

Fig. 12

Fig. 129


Nerve Supply of Perineum, female.
from Hasse, Sappey. Piersol Peham. (Basle Nomenclature)
ilio-hypogastricus
ilio-inguinalis
N. ilio-inguinalis
R. spermaticus externus vel R labialis anterior ex N. genito-femoralis (genito-crural) Hasse, Piersol.
Ramus lab. ant.
R L D
F H E
Peham
N. dors. clit.
N. labialis ant.
Nervus vestibulus vag. et urethrae. (Hasse)
Ramus labialis post. Ramus perineus N. pud
(Peham)
N. labialis post.
Ramus perinealis Piersol
N. perineus
Nervus pudendus
N. hemorr. inf.
Ramus hemorrhoidalis inf N. pud
N. cutaneous femoris posterior (small sciatic)



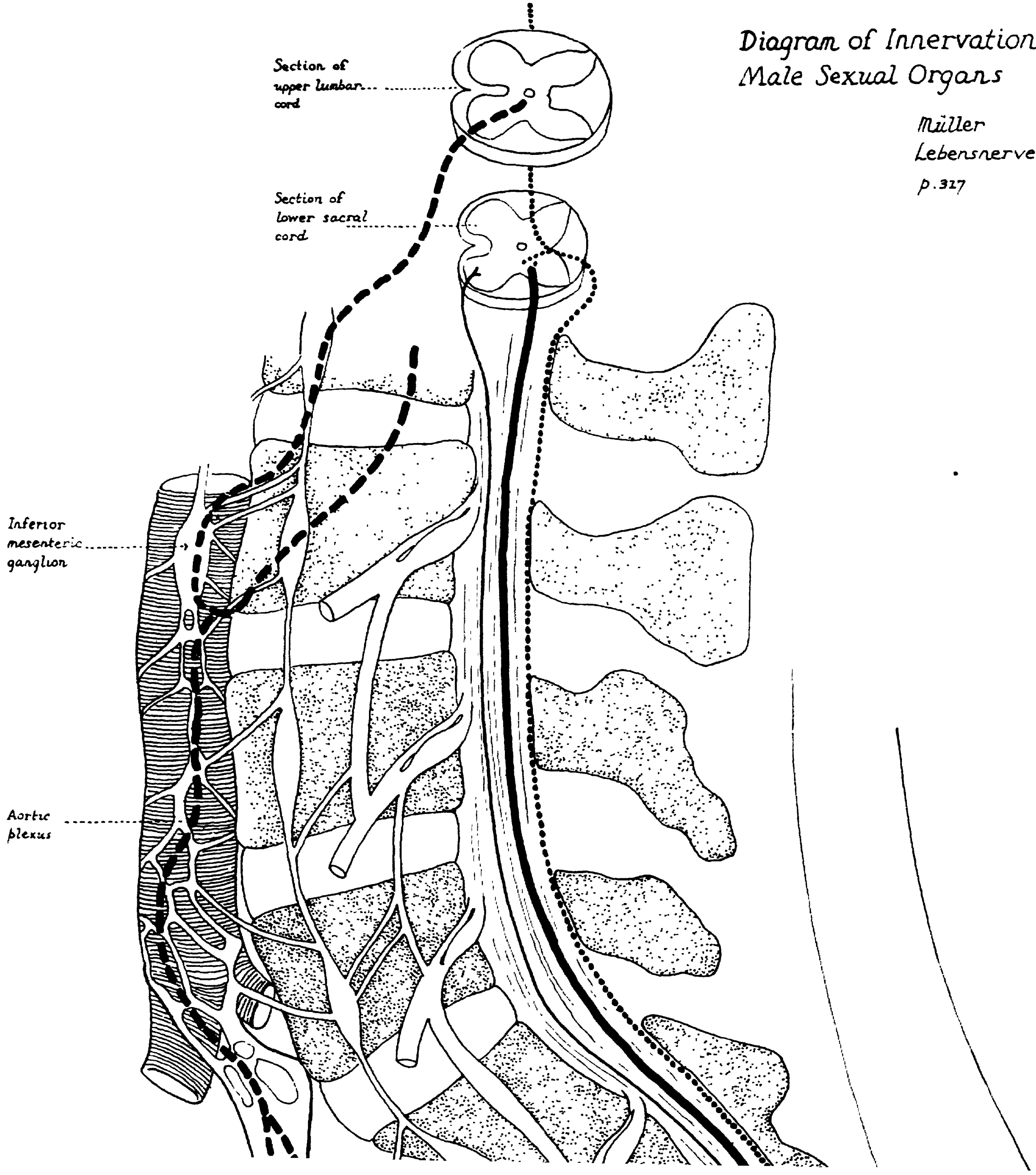
from
Hasse +
Waldeyer
+ B.N.A.

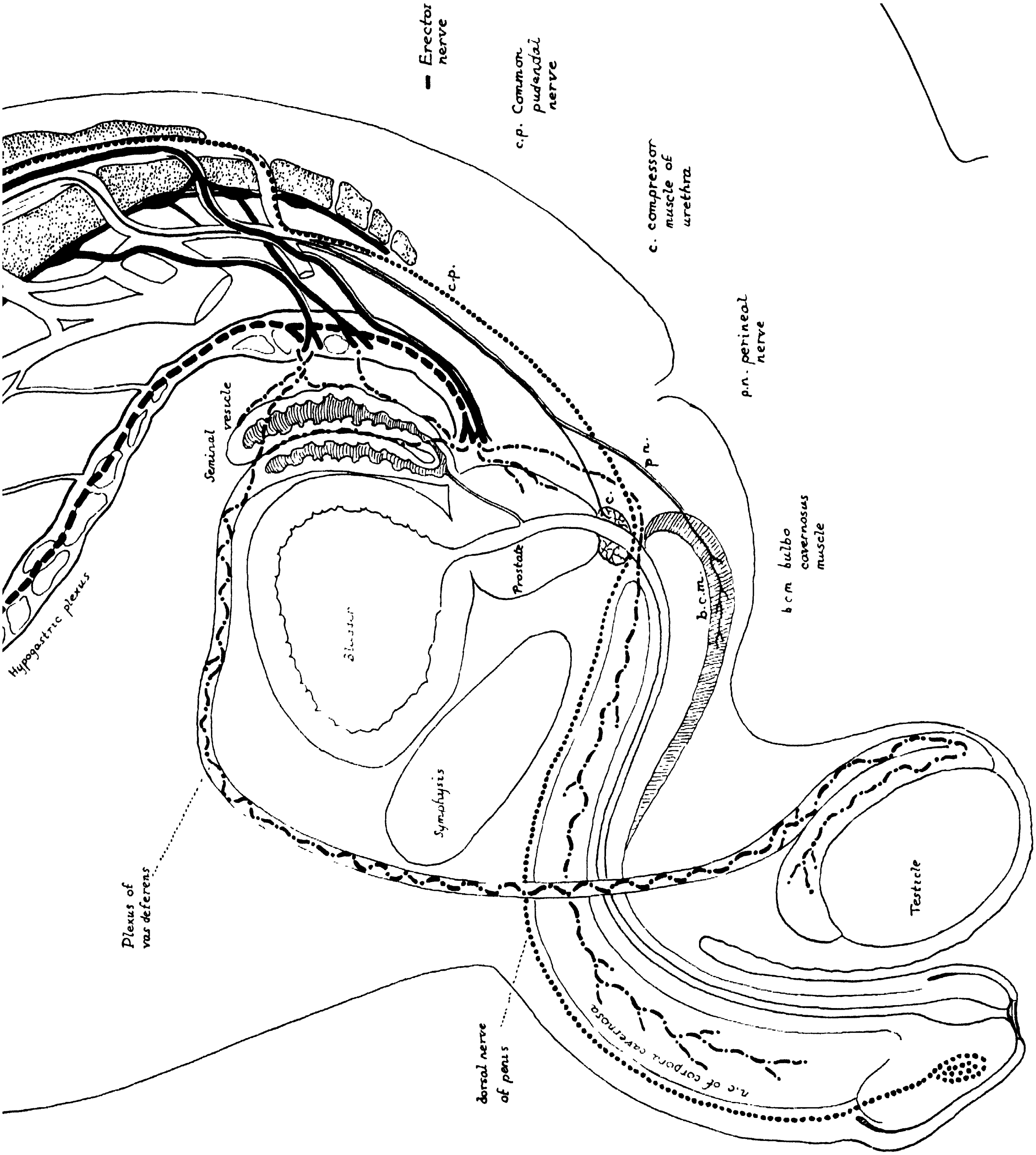
Nerve Supply Areas, Female Pelvic Floor

Fig. 13

Diagram of Innervation of Male Sexual Organs

Müller
Lebensnerven
p.327

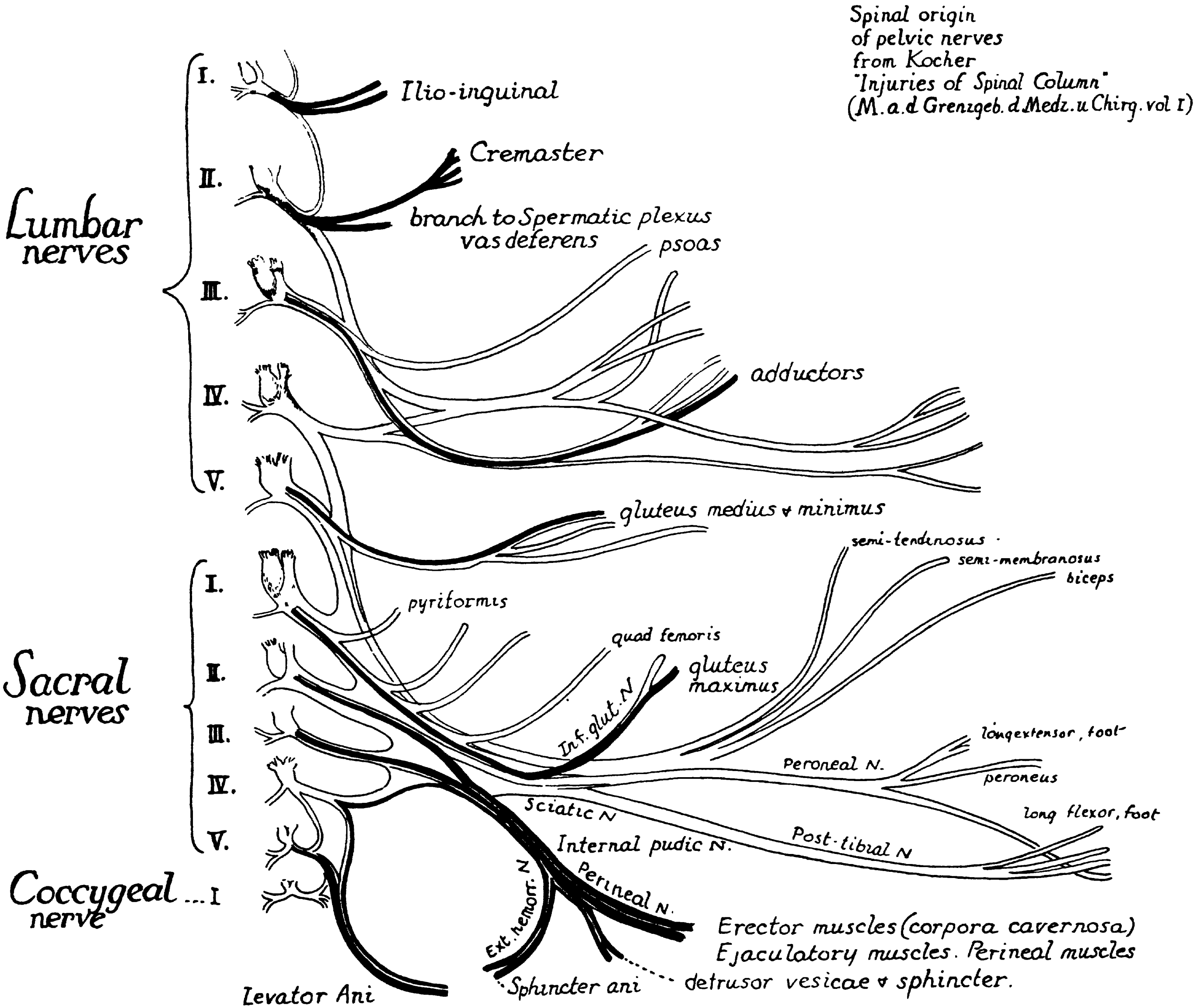

Section of upper lumbar cord
Section of lower sacral cord
Inferior mesenteric ganglion
Aortic plexus



Erector nerve
c.p. Common pudendal nerve
c. compressor muscle of urethra
p.n. perineal nerve
b c m bulbo cavernosus muscle
c.p.
p.n.
c.
b.c.m.
Seminal vesicle
Prostate
Bladder
Symphysis
Testicle
Hypogastric plexus
Plexus of vas deferens
dorsal nerve of penis
n.c of corpora cavernosa

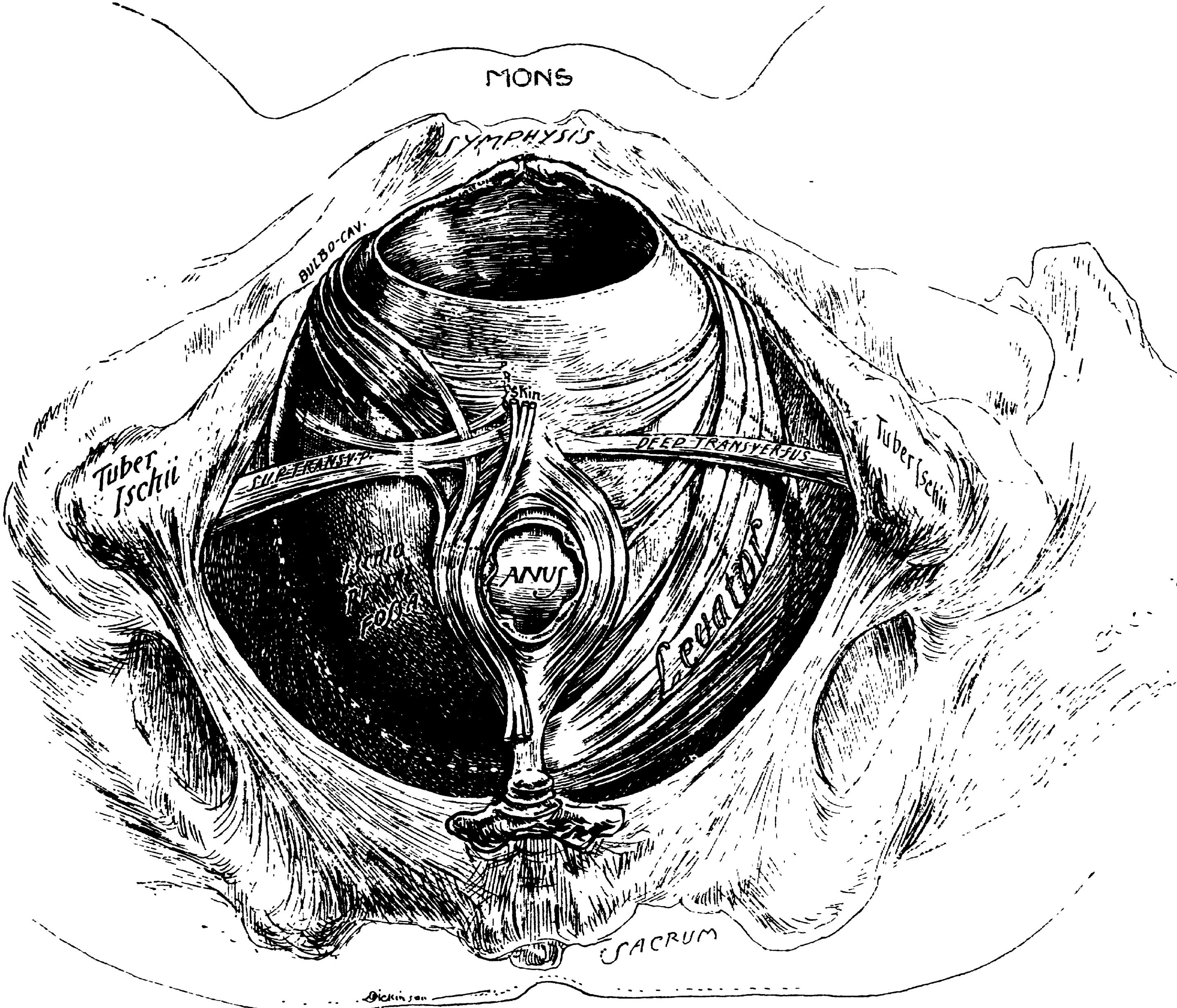
Fig. 131

Fig. 132



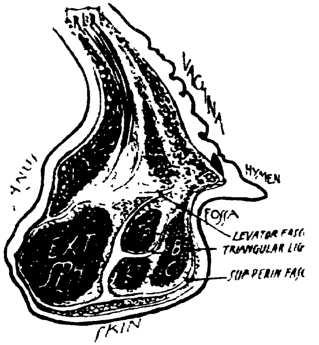
Spinal origin of pelvic nerves from Kocher "Injuries of Spinal Column" (M. a. d Grenzgeb. d Medz. u Chirg. vol I)

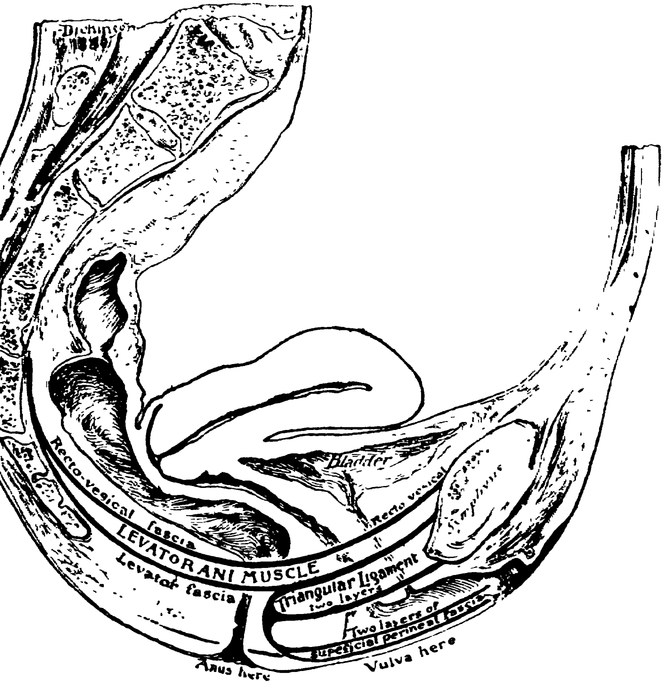
Spinal Origin of Nerves to Pelvic Structures. (Kocher.)



Pelvic Floor Muscles fully stretched at Labor.

Fig. 133





Above:- Fascia of Perineal Body
Below:- Fascia of Pelvic Floor
To Right:- Muscles of Pelvic
Floor.

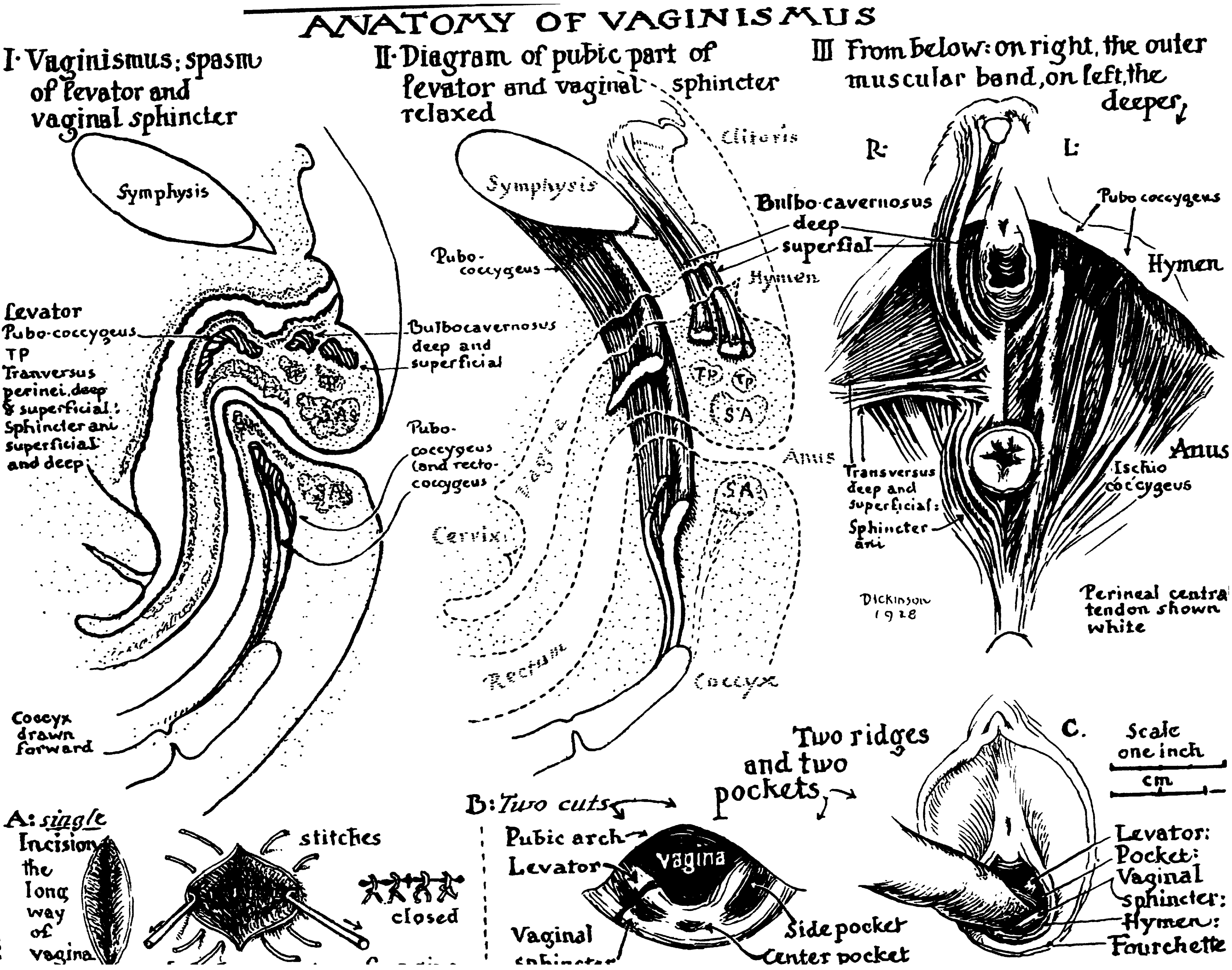
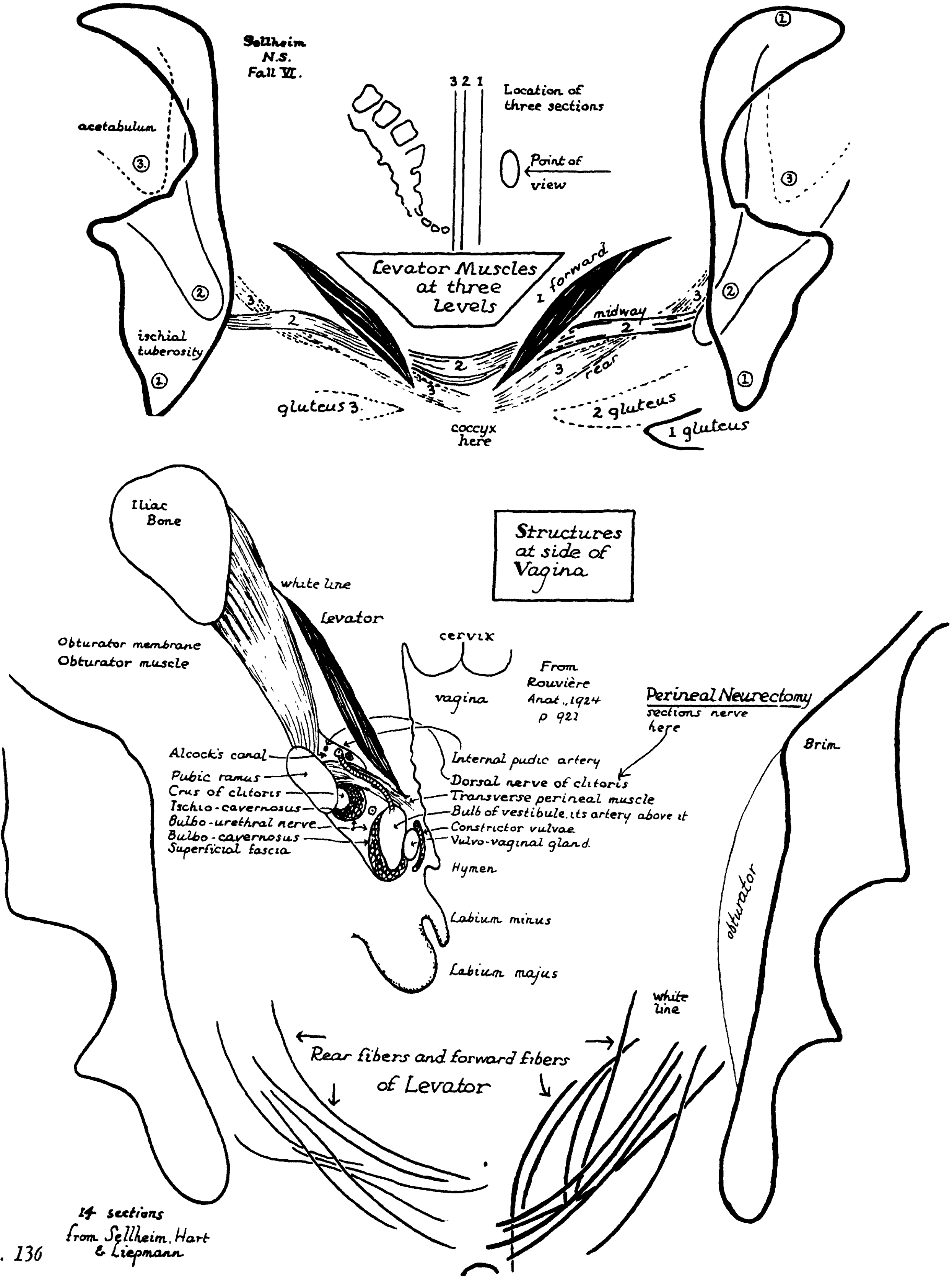
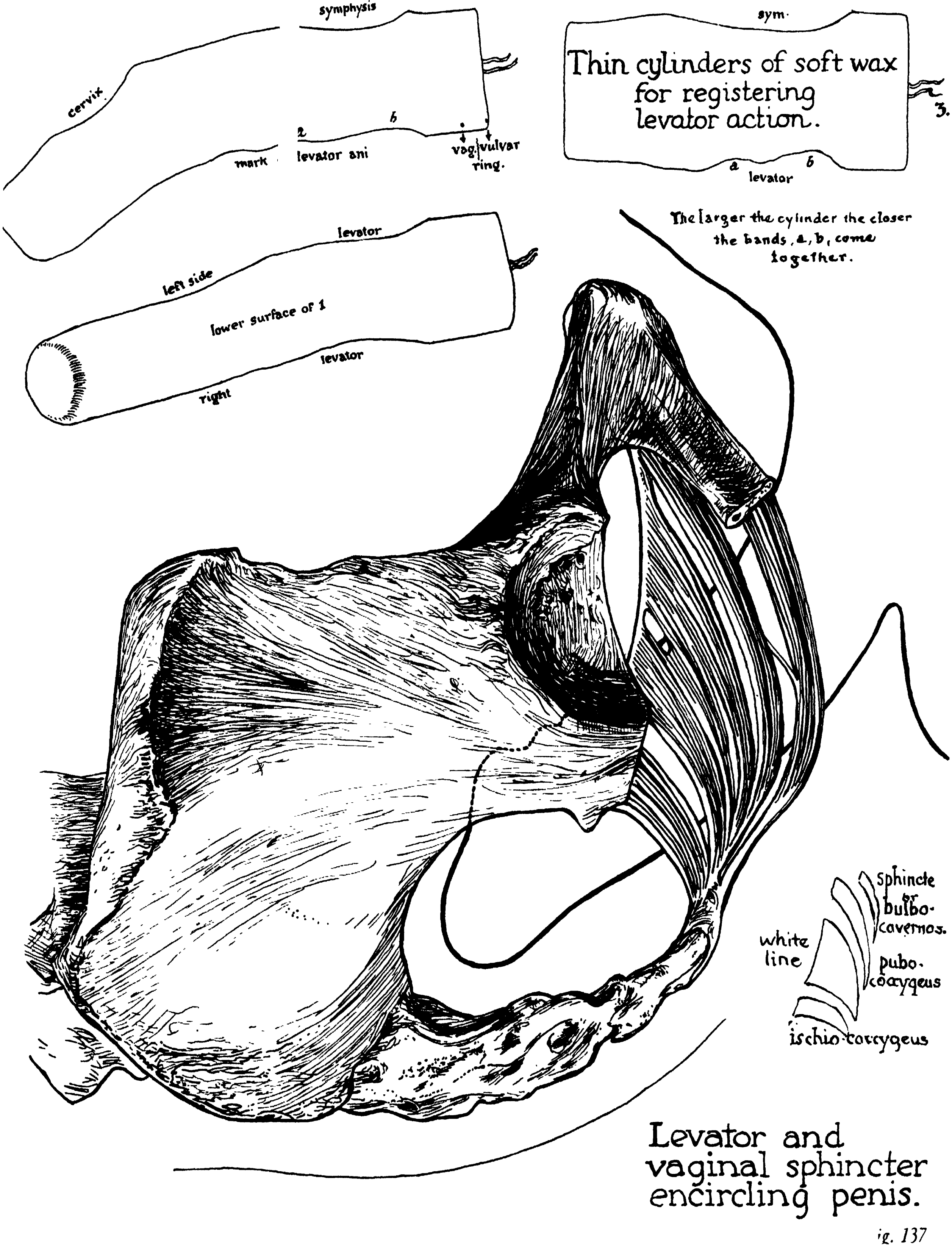

ANATOMY OF VAGINISMUS
I· Vaginismus: spasm of levator and vaginal sphincter
Symphysis
Levator
Pubo-coccygeus
TP
Tranversus perinei, deep & superficial:
Sphincter ani superficial and deep
Bulbocavernosus deep and superficial
Pubo-coccygeus (and recto-coccygeus
Coccyx drawn forward
II· Diagram of pubic part of levator and vaginal sphincter relaxed
Symphysis
Clitoris
Pubo-coccygeus
Bulbo-cavernosus
deep
superfial
Hymen
TP
Tp
SA
Anus
SA
Vagina
Cervix
Rectum
Coccyx
III From below: on right, the outer muscular band, on left, the deeper
R:
L:
Pubo coccygeus
Hymen
Anus
Ischio coccygeus
Transversus deep and superficial:
Sphincter ani
Perineal central tendon shown white
DICKINSON 1928
A: single Incision the long way of vagina
stitches
closed
B: Two cuts
Two ridges and two pockets
Pubic arch
Levator
vagina
Vaginal
Side pocket
Center pocket
C.
Scale one inch
cm
Levator:
Pocket:
Vaginal sphincter:
Hymen:
Fourchette

Fig. 135



14 sections from Sellheim, Hart & Liepmann

Fig. 136



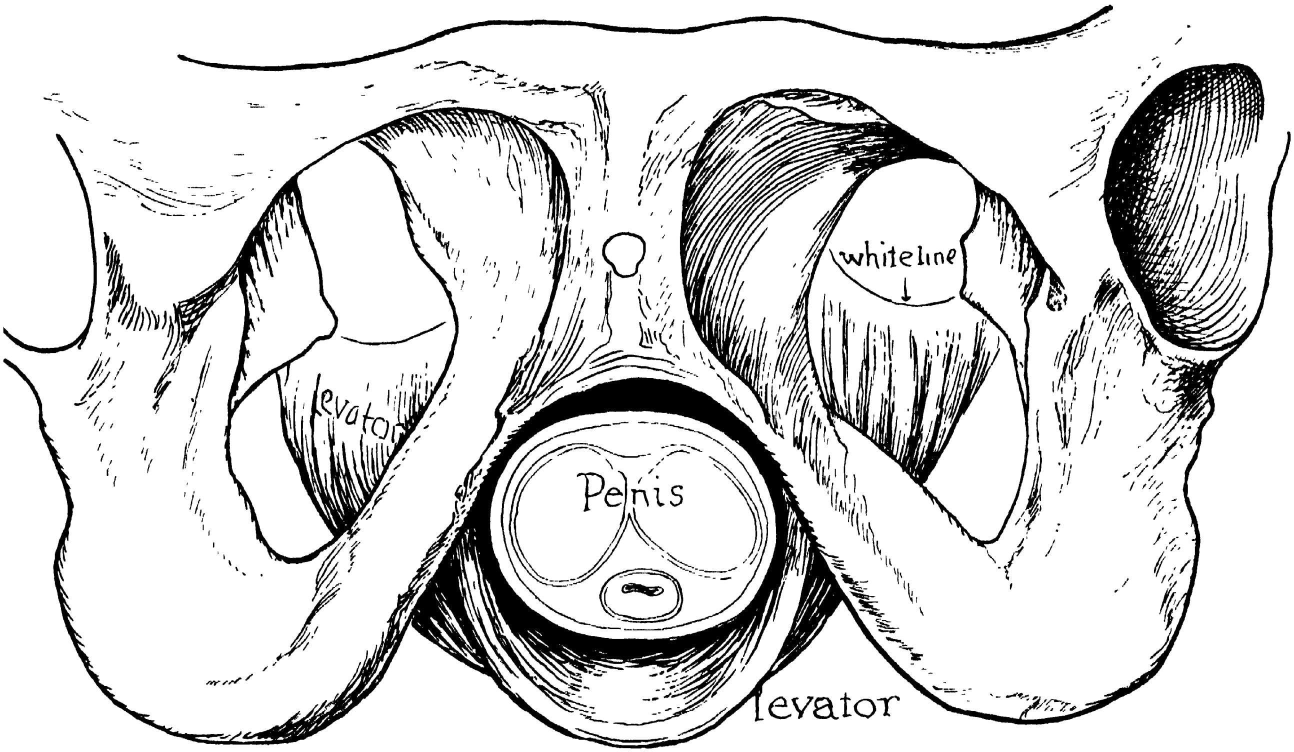
Thin cylinders of soft wax for registering levator action.

The larger the cylinder the closer the bands, a, b, come together.

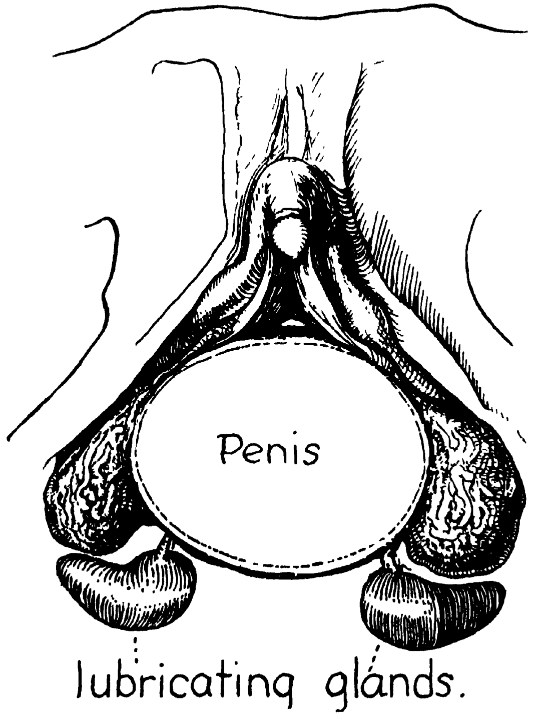
Levator and vaginal sphincter encircling penis.

ig. 137

Pubic arch, sub-pubic ligament, and penis.

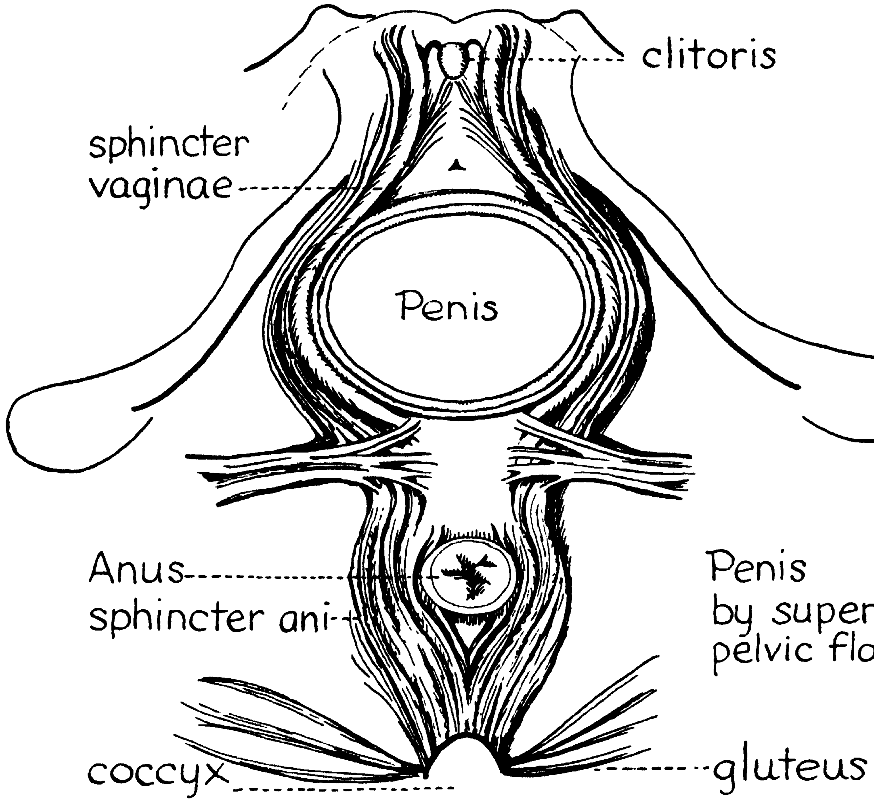


Erectile structures; clitoris (and ligament) its crura and bulbs of vestibule.



Pelvic Outlet from front.

RLD.



Penis
by superficial
pelvic floor muscles

Pelvic Outlet from below.

Penis encircled
by deep pelvis
muscles.

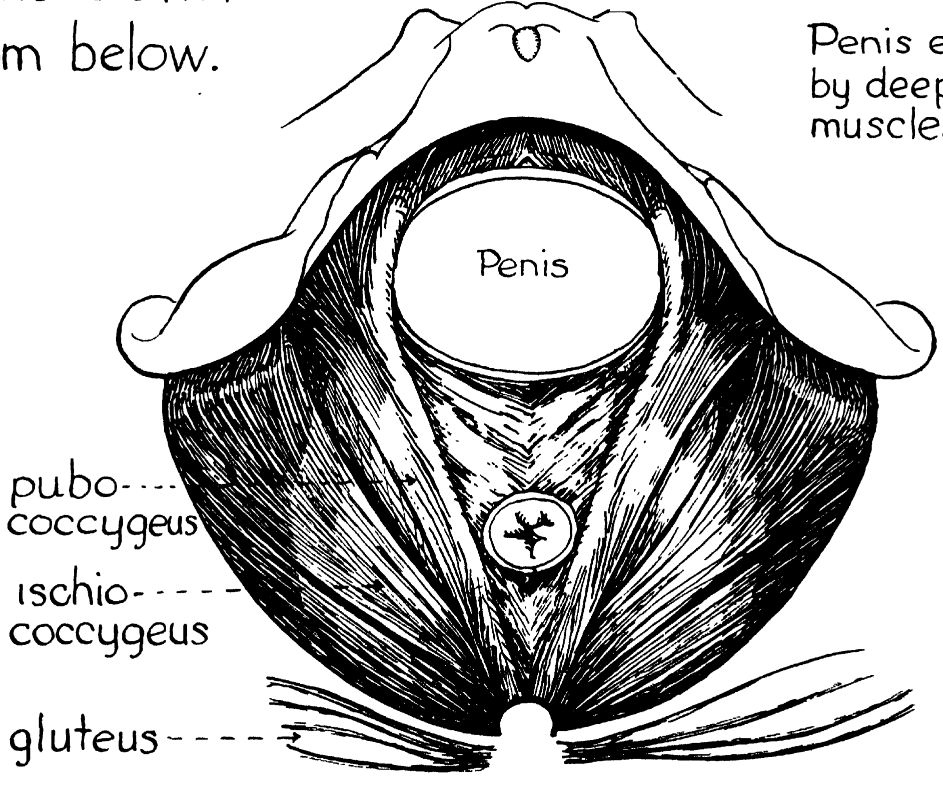
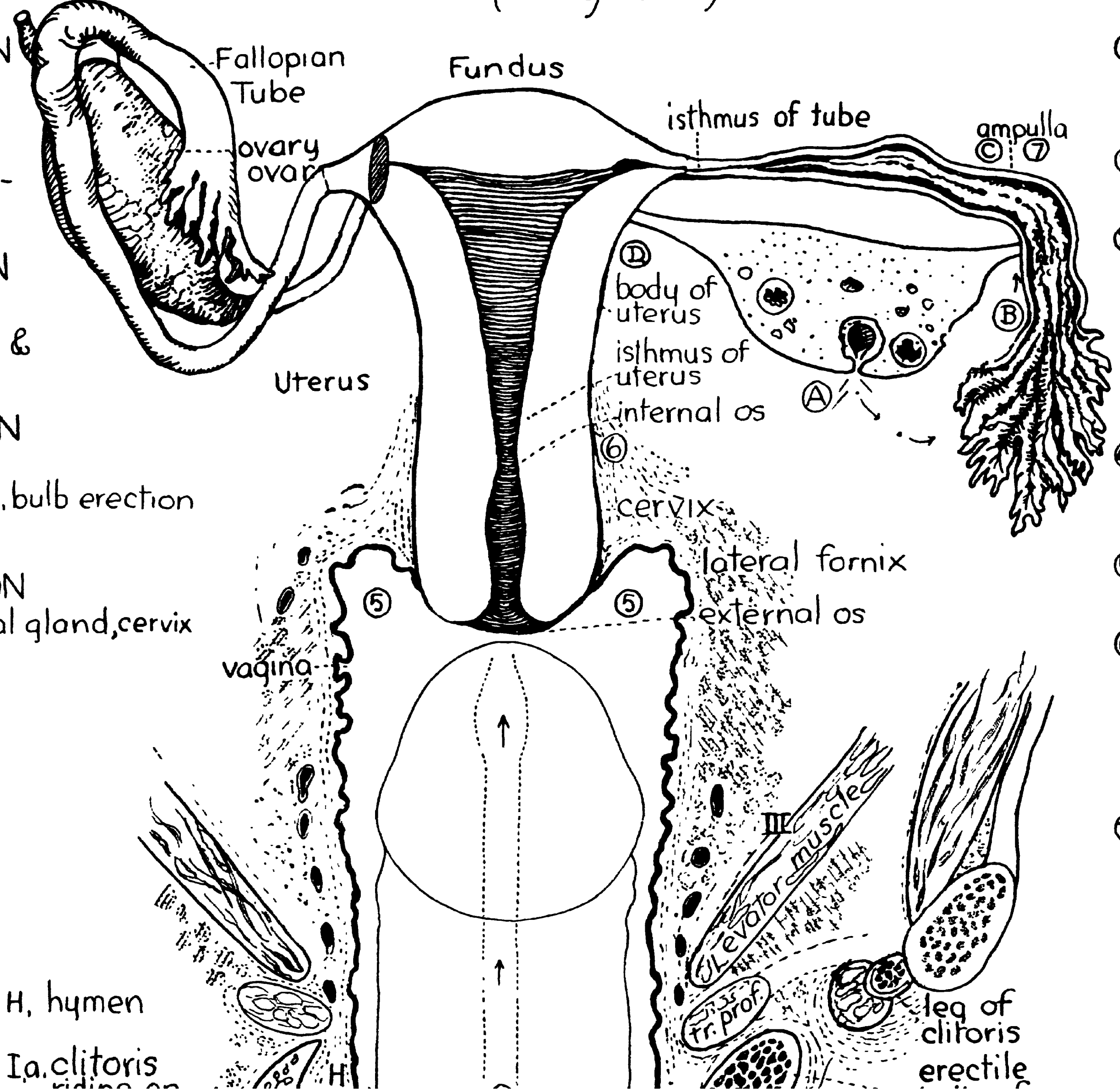


Fig. 139

Map of the Route of the Sperms and Ovum.

(diagram)



Ovum

Ⓐ OVULATION

Ⓑ 8 DAY PASSAGE

Ⓒ FERTILIZATION

Ⓓ NIDATION

Sensations & Processes.

I, EXCITATION

I, a, clitoris

I, b, vaginal, bulb erection

I, c, cervix

II, LUBRICATION

vulvo-vaginal gland, cervix

III, SEIZURE

of male (Penetration incomplete)

Sperms

① MANUFACTURE of sperms in testicle

② STORAGE (chiefly) in epididymis

③ STIMULATION & DILUTION of sperms by prostatic and seminal vesicle secretion.

④ EJACULATION epididymis to cervix

⑤ DEPOSIT of semen.

⑥ 2 to 4 HOUR PASSAGE of sperms from cervix to upper tube.

⑦ FERTILIZATION meeting-place of ovum and sperm

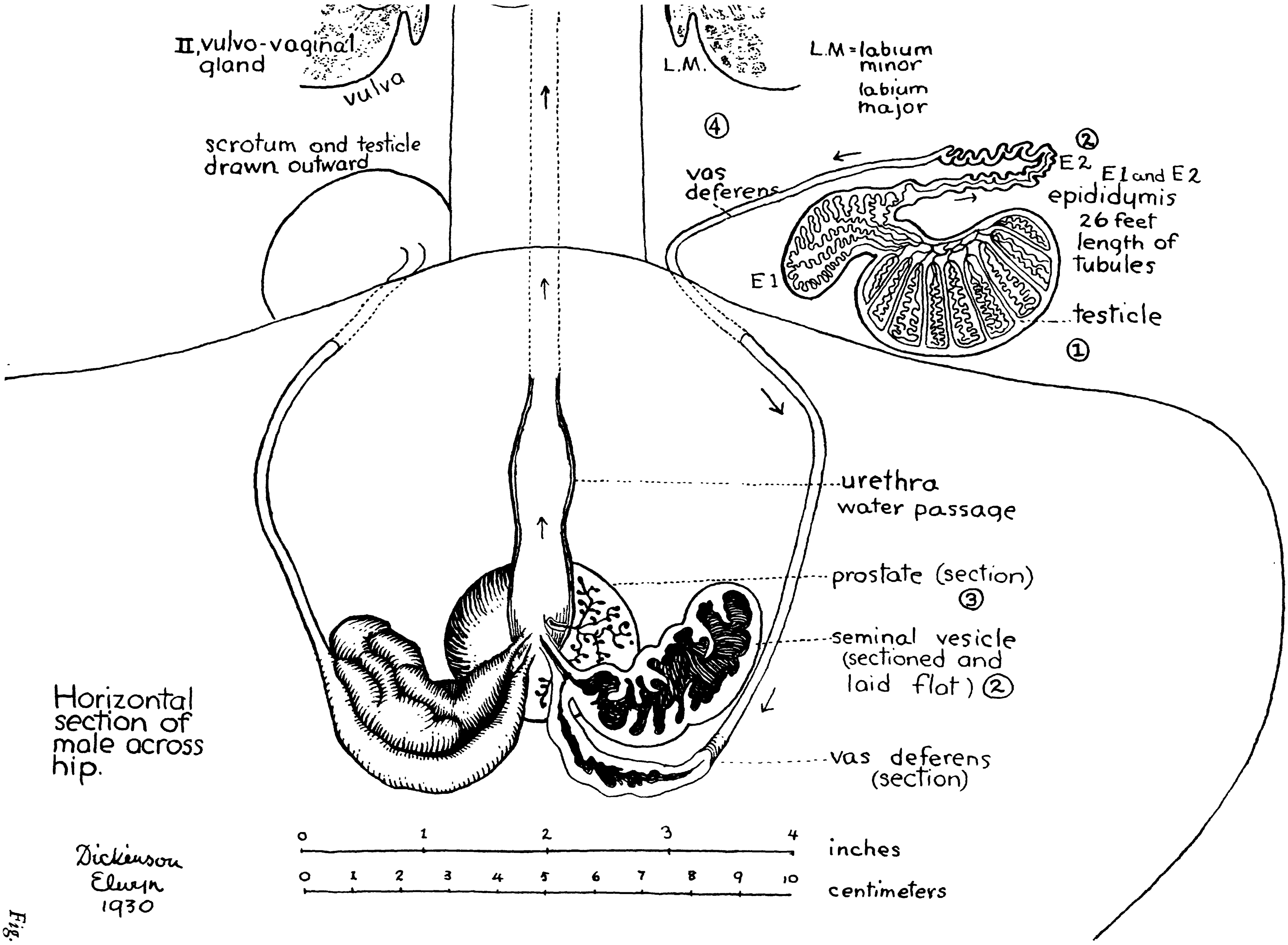

II, vulvo-vaginal gland
vulva
L.M.
L.M = labium minor
labium major
④
scrotum and testicle drawn outward
vas deferens
②
E2
E1 and E2 epididymis 26 feet length of tubules
E1
testicle
①
urethra water passage
prostate (section) ③
seminal vesicle (sectioned and laid flat) ②
vas deferens (section)
Horizontal section of male across hip.
0 1 2 3 4 inches
0 1 2 3 4 5 6 7 8 9 10 centimeters
Dickinson Elwyn 1930

Fig. 140

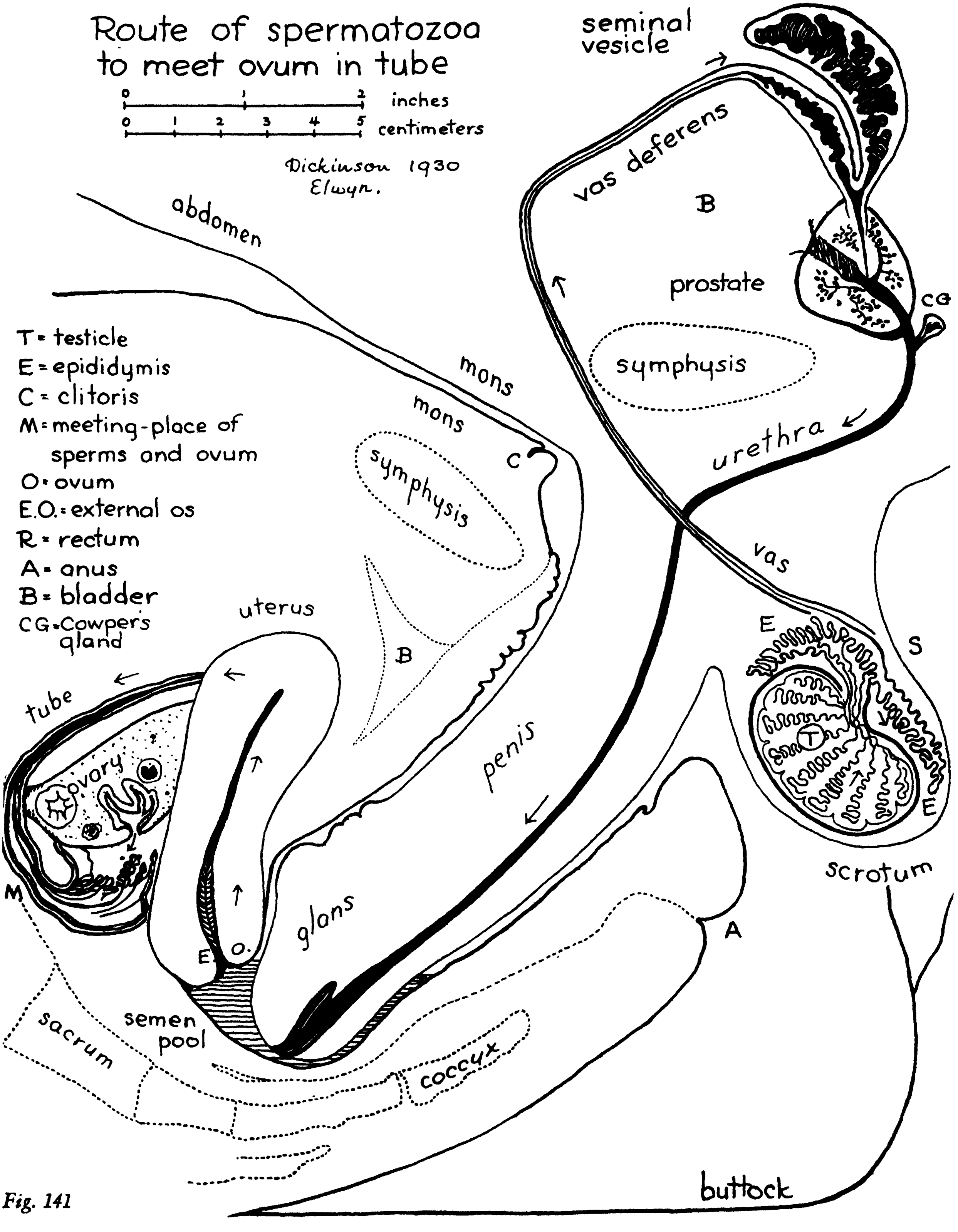

Route of spermatozoa
to meet ovum in tube
0 1 2 inches
0 1 2 3 4 5 centimeters
Dickinson 1930
Elwyn.
T = testicle
E = epididymis
C = clitoris
M = meeting-place of sperms and ovum
O = ovum
E.O. = external os
R = rectum
A = anus
B = bladder
CG = Cowper's gland
seminal vesicle
vas deferens
B
prostate
CG
symphysis
urethra
abdomen
mons
mons
C
symphysis
uterus
B
tube
ovary
M
E.
O.
glans
penis
vas
E
S
T
E
scrotum
A
semen pool
sacrum
coccyx
buttock

Fig. 141

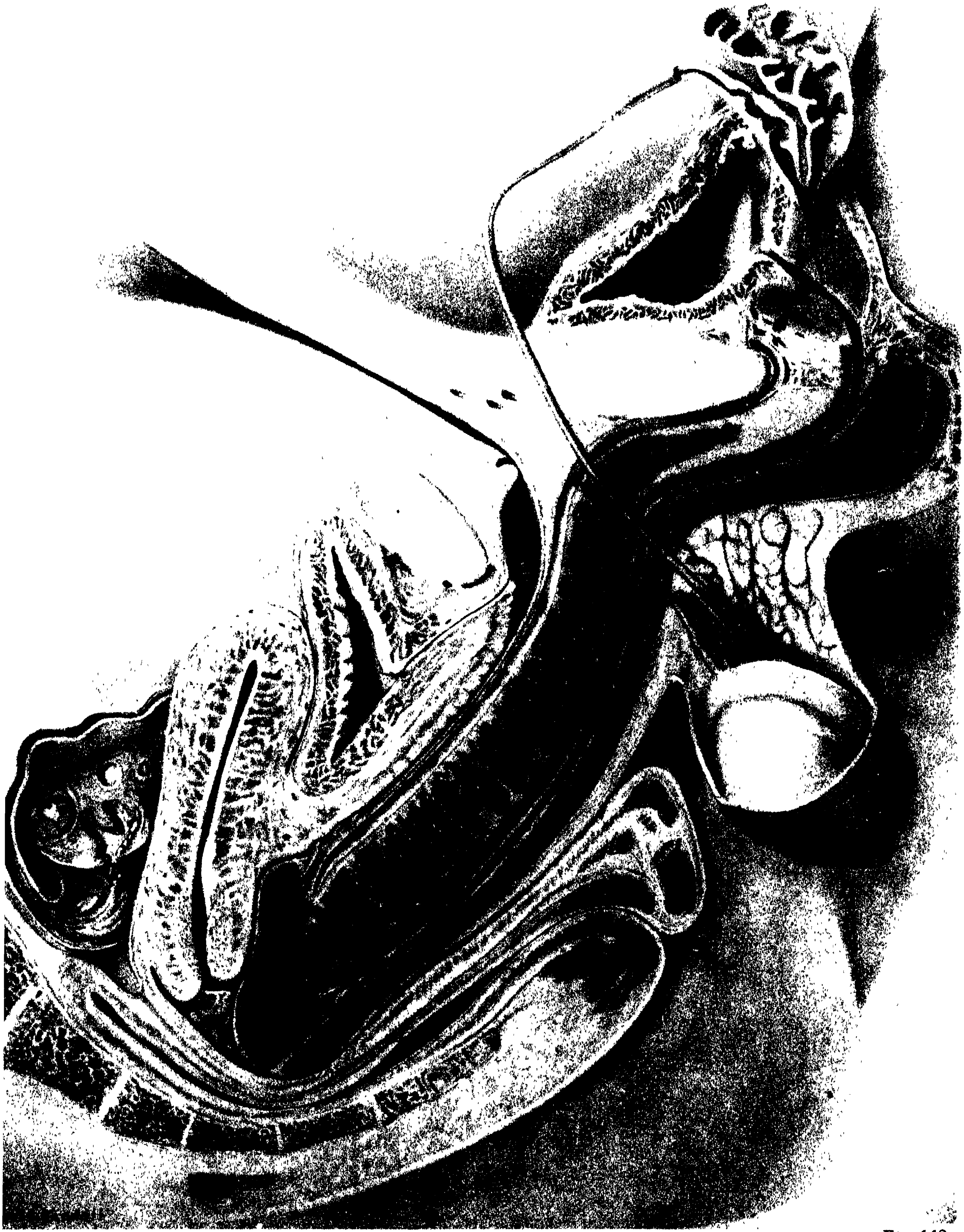


Fig. 142

Displacement of parts during coitus.

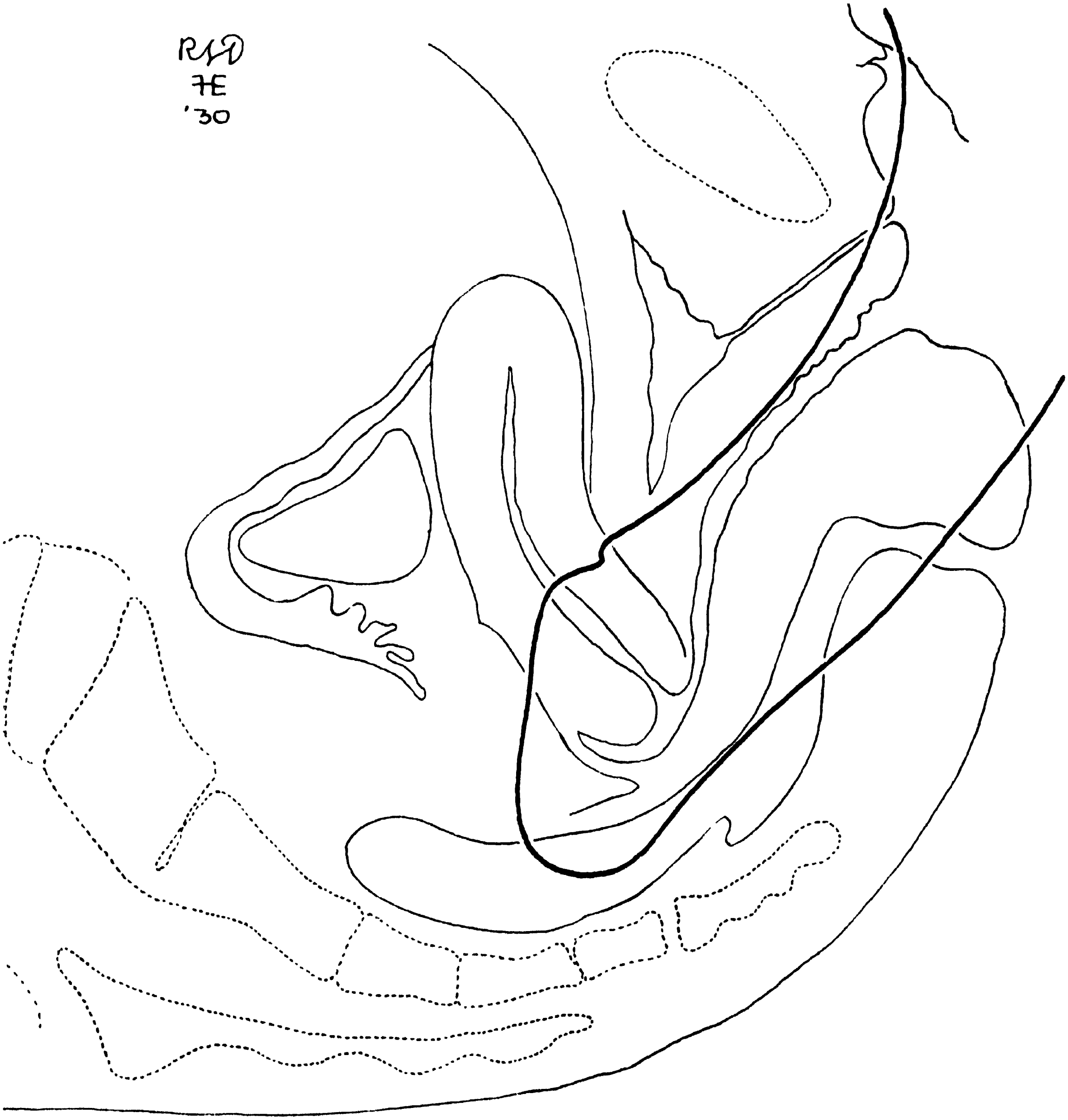


Fig. 143

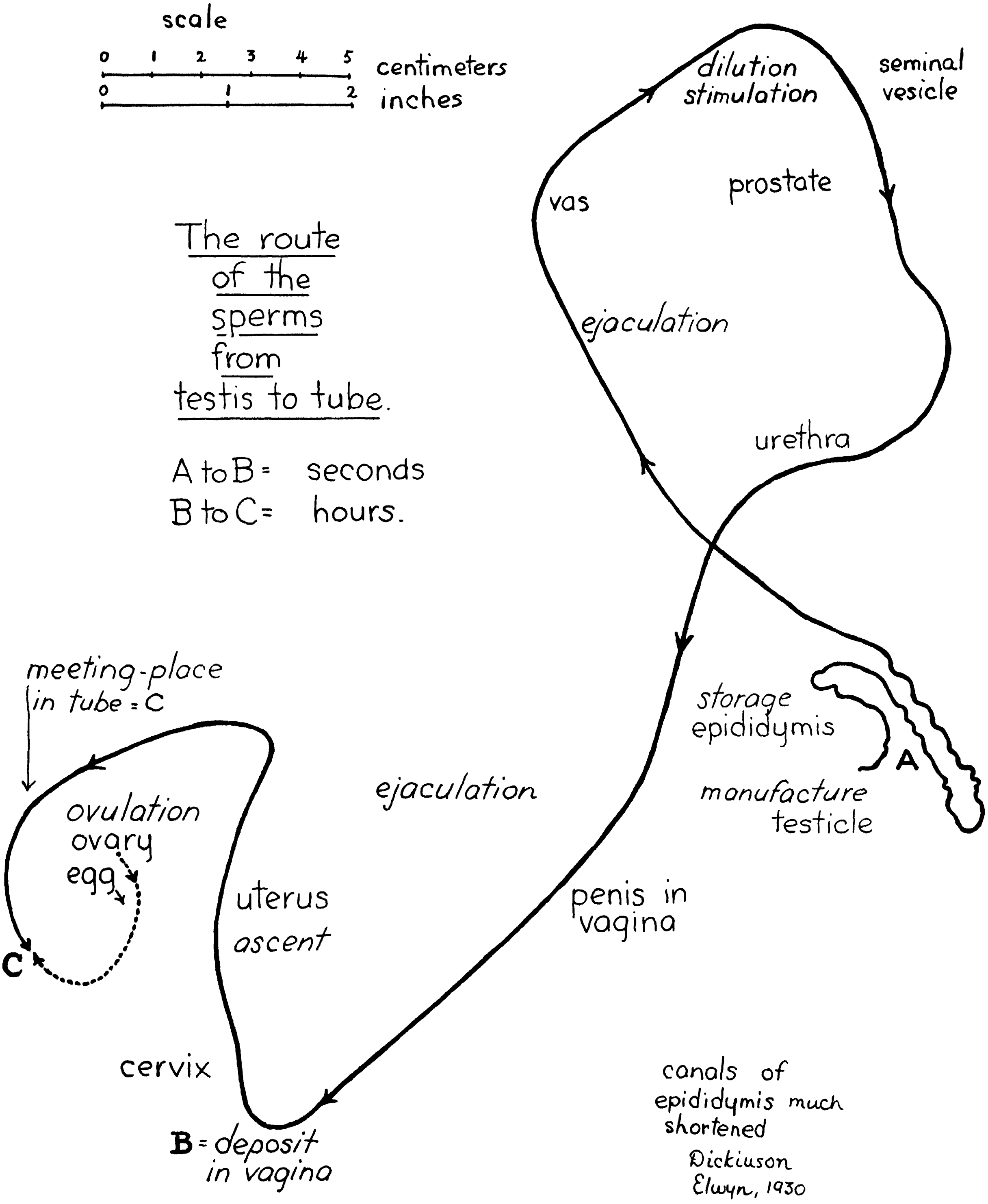
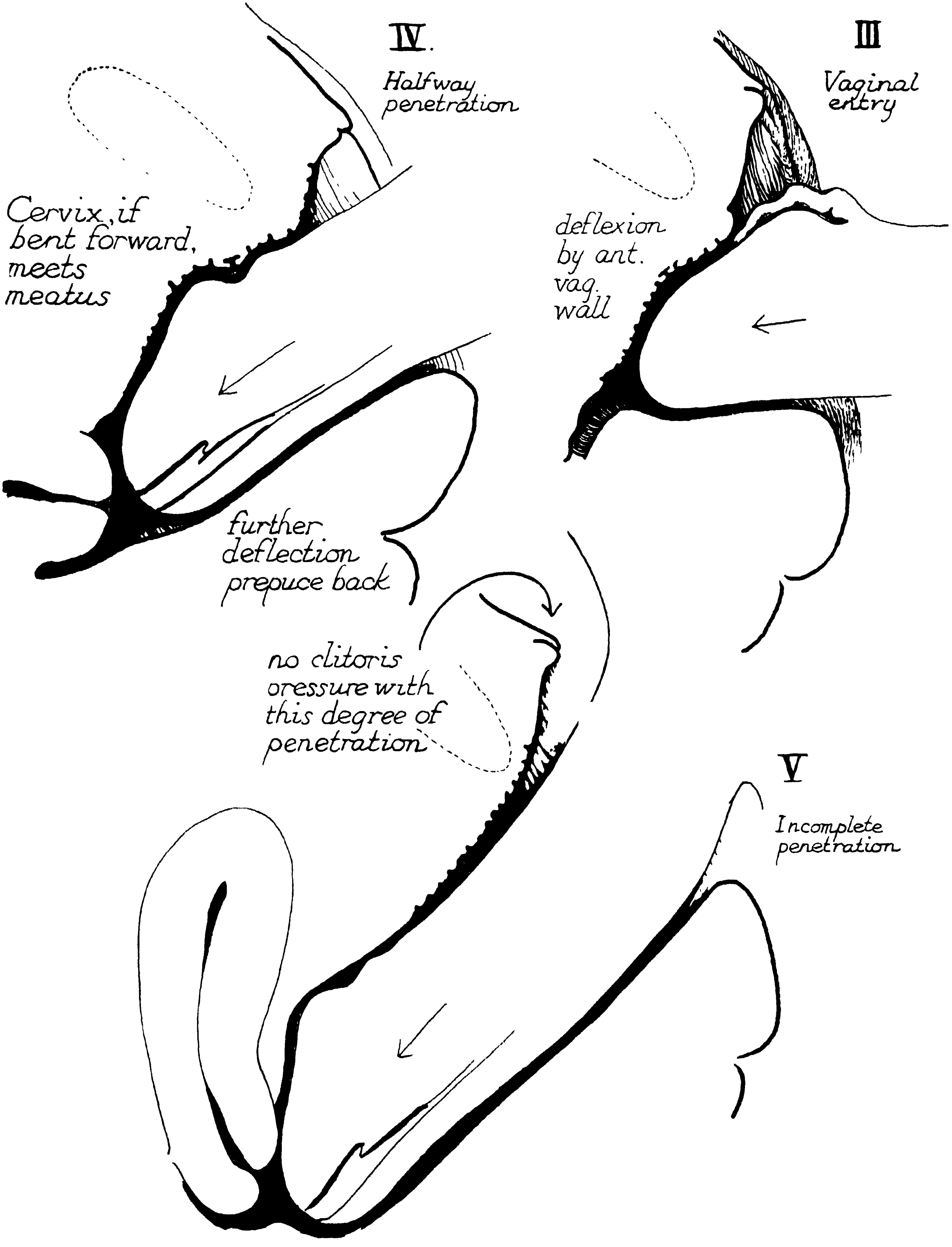
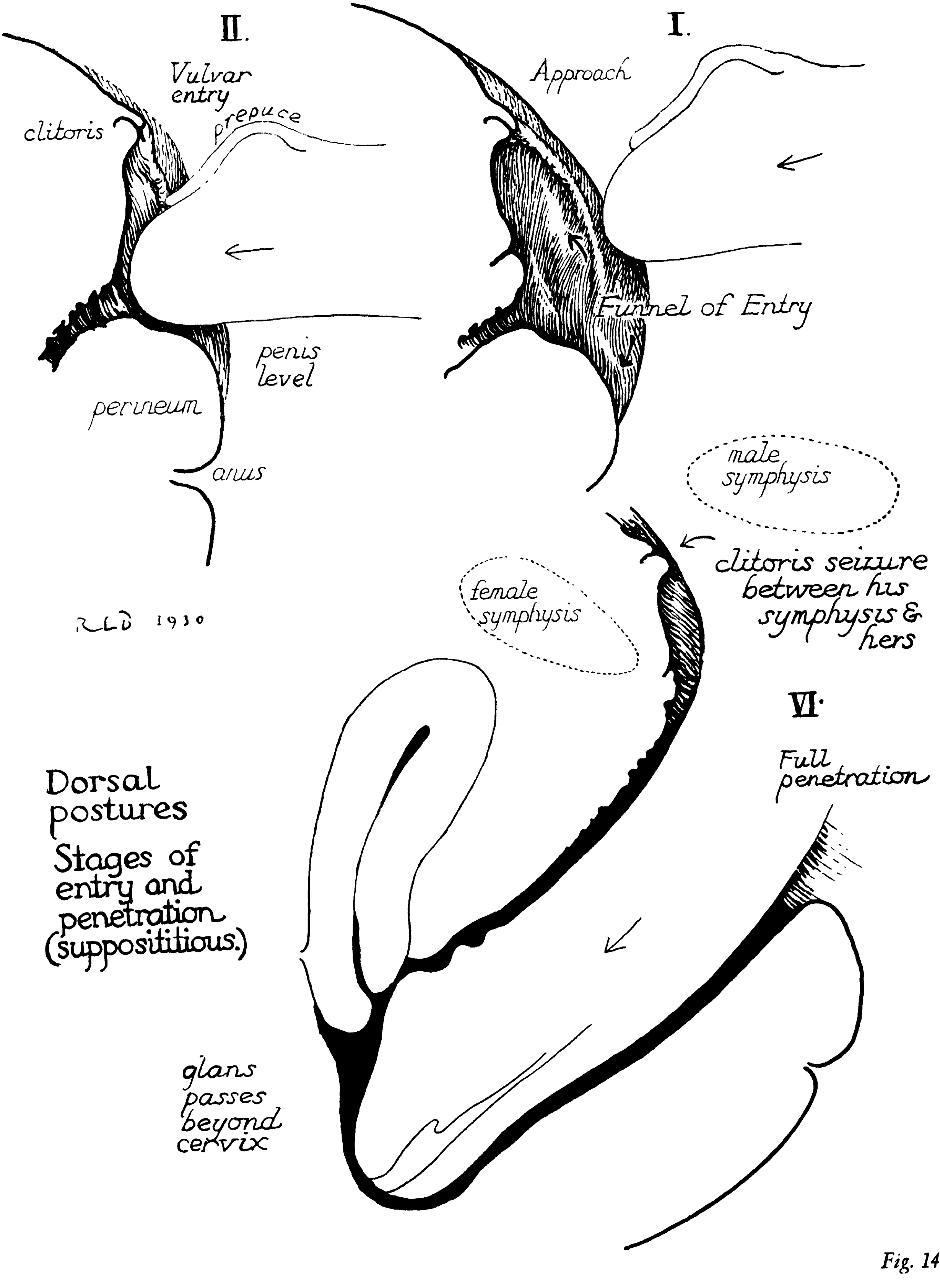

scale
0 1 2 3 4 5 centimeters
0 1 2 inches
The route of the sperms from testis to tube.
A to B = seconds
B to C = hours.
dilution
stimulation
seminal vesicle
vas
prostate
ejaculation
urethra
storage
epididymis
A
manufacture
testicle
meeting-place in tube = C
ovulation
ovary
egg
C
ejaculation
uterus
ascent
penis in vagina
cervix
B = deposit in vagina
canals of epididymis much shortened
Dickinson
Elwyn, 1930

Fig. 144

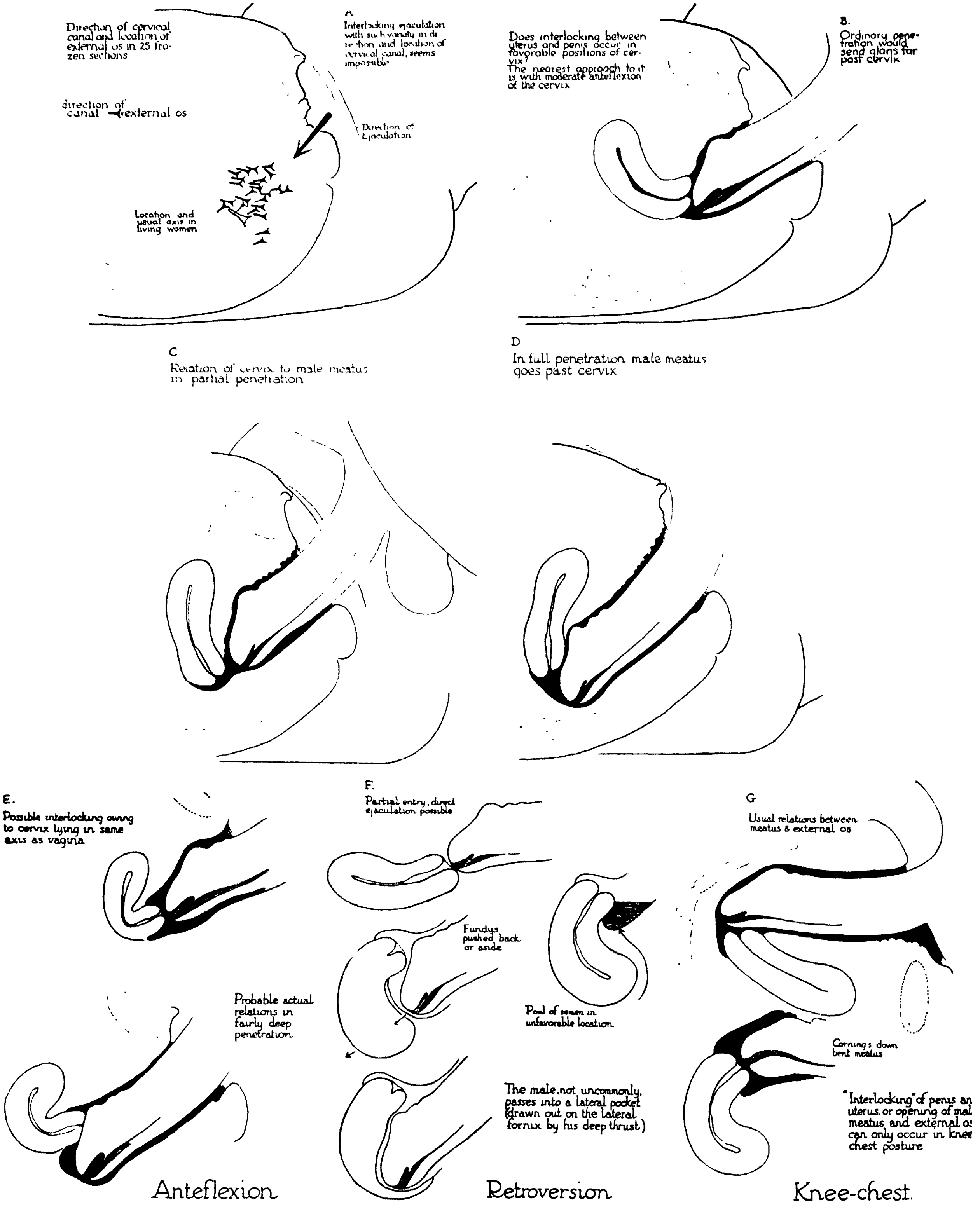

IV.
Halfway penetration
Cervix, if bent forward, meets meatus
further deflection prepuce back
III
Vaginal entry
deflexion by ant. vag. wall
no clitoris oressure with this degree of penetration
V
Incomplete penetration



Dorsal postures

Stages of entry and penetration (supposititious.)

Fig. 145


Direction of cervical canal and location of external os in 25 frozen sections
direction of canal
external os
Location and usual axis in living women
A
Interlocking ejaculation with such variety in direction and location of cervical canal, seems impossible
Direction of Ejaculation
Does interlocking between uterus and penis occur in favorable positions of cervix?
The nearest approach to it is with moderate anteflexion of the cervix
B.
Ordinary penetration would send glans far past cervix
C
Relation of cervix to male meatus in partial penetration
D
In full penetration male meatus goes past cervix
E.
Possible interlocking owing to cervix lying in same axis as vagina
Probable actual relations in fairly deep penetration
F.
Partial entry, direct ejaculation possible
Fundus pushed back or aside
Pool of semen in unfavorable location
The male, not uncommonly, passes into a lateral pocket (drawn out on the lateral fornix by his deep thrust)
G
Usual relations between meatus & external os
Cornings down bent meatus
"Interlocking" of penis an uterus, or opening of mal meatus and external os can only occur in knee chest posture
Anteflexion
Retroversion
Knee-chest.

Possibilities of Interlocking in various postures.

Fig. 146

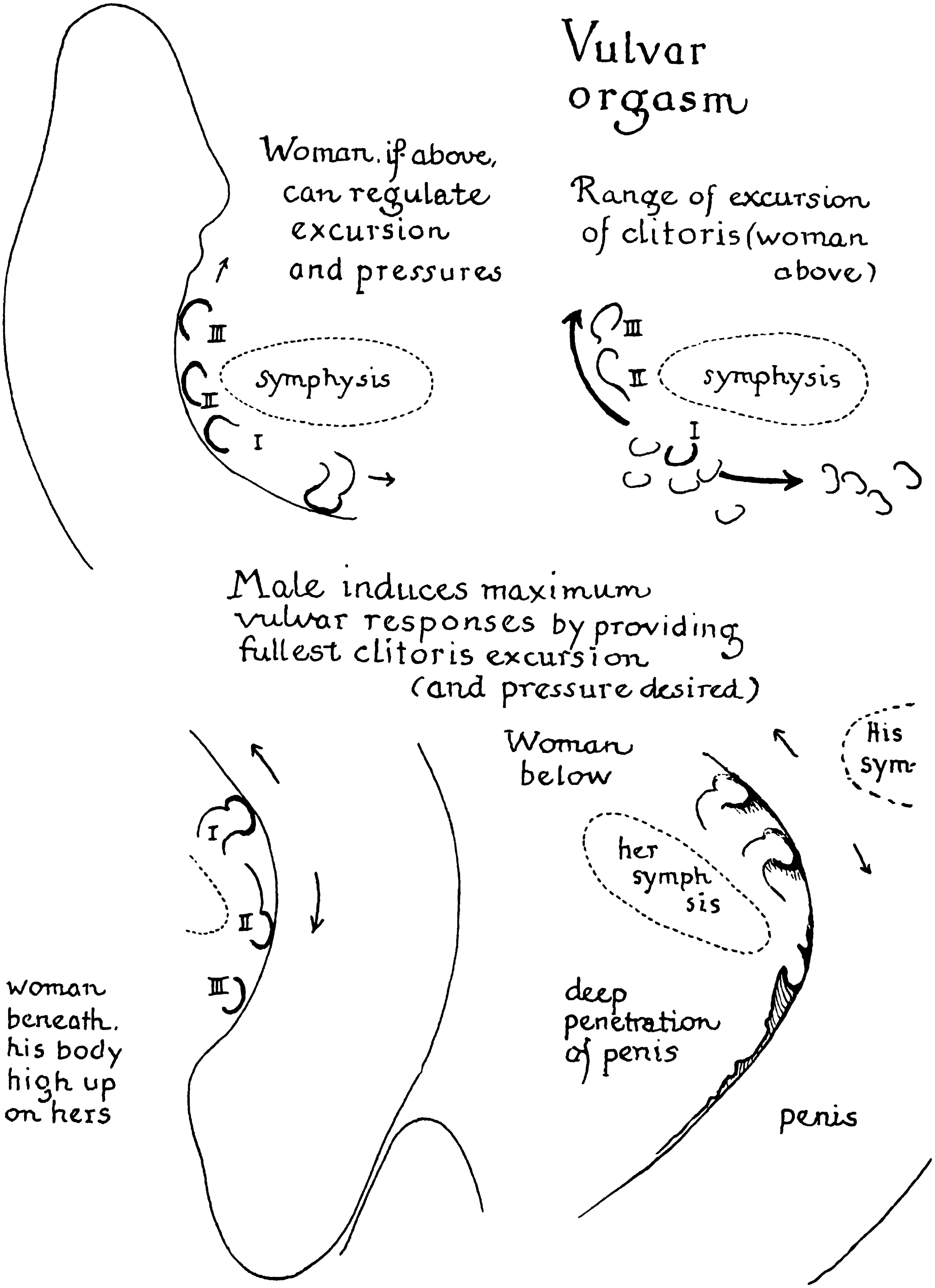

Vulvar orgasm
Woman, if above, can regulate excursion and pressures
III
II
I
symphysis
Range of excursion of clitoris (woman above)
III
II
I
symphysis
Male induces maximum vulvar responses by providing fullest clitoris excursion (and pressure desired)
I
II
III
woman beneath, his body high up on hers
Woman below
His sym-
her symph sis
deep penetration of penis
penis

Fig. 147

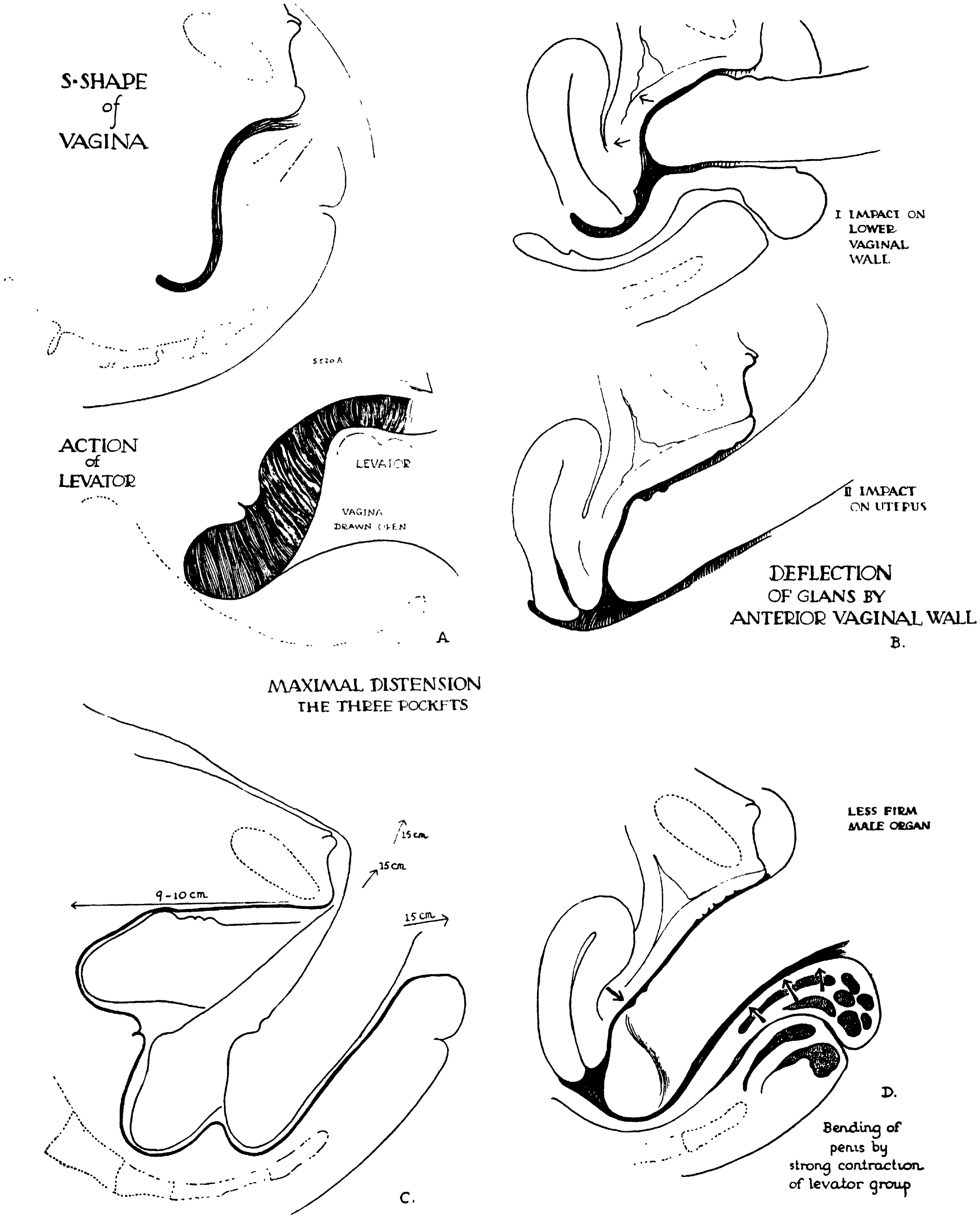

S-SHAPE of VAGINA
SEROSA
ACTION of LEVATOR
LEVATOR
VAGINA DRAWN OPEN
A
I IMPACT ON LOWER VAGINAL WALL
II IMPACT ON UTERUS
DEFLECTION OF GLANS BY ANTERIOR VAGINAL WALL
B.
MAXIMAL DISTENSION THE THREE POCKETS
15 cm
15 cm
15 cm
9-10 cm
C.
LESS FIRM MALE ORGAN
D.
Bending of penis by strong contraction of levator group

Fig. 148

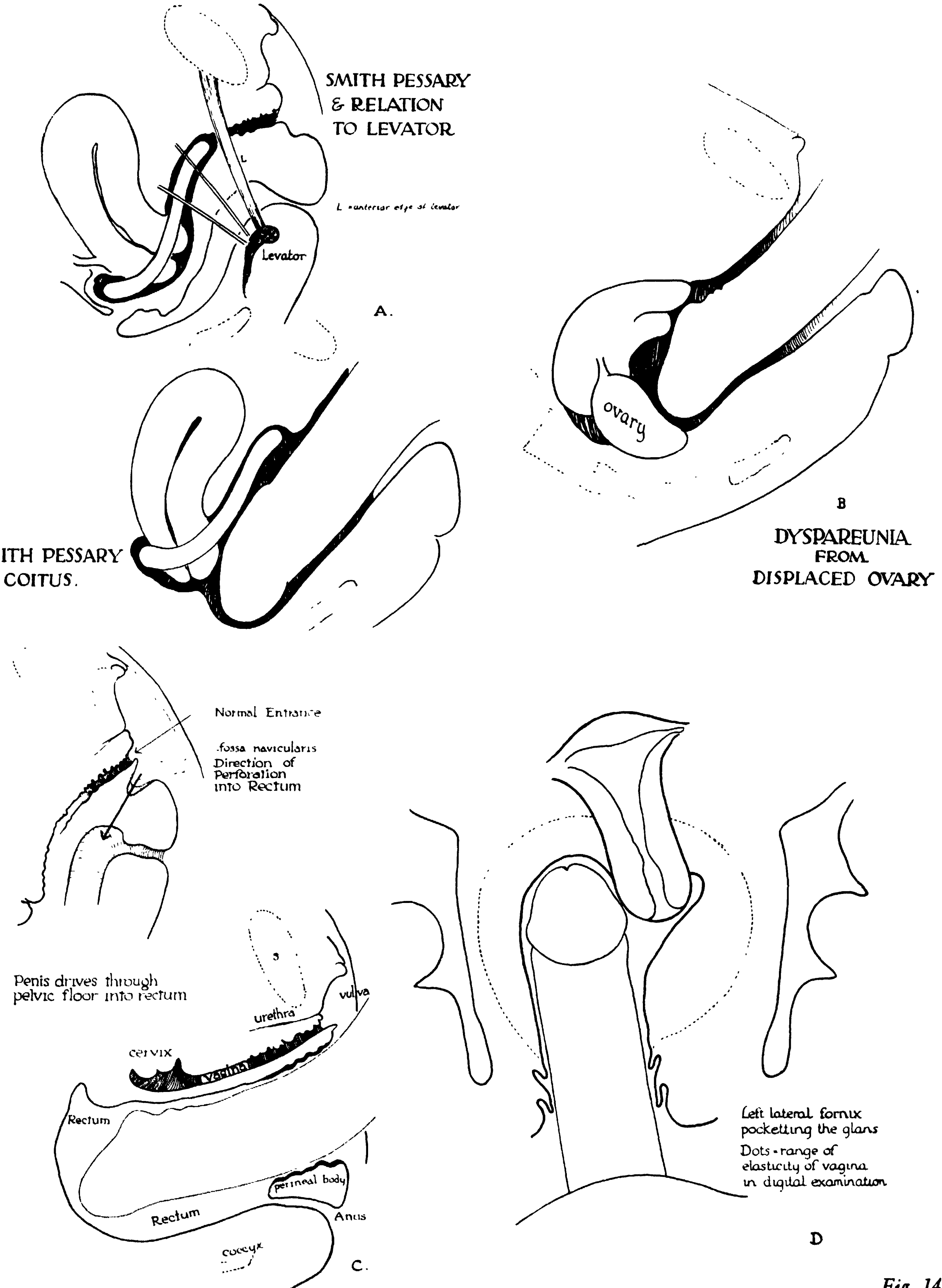
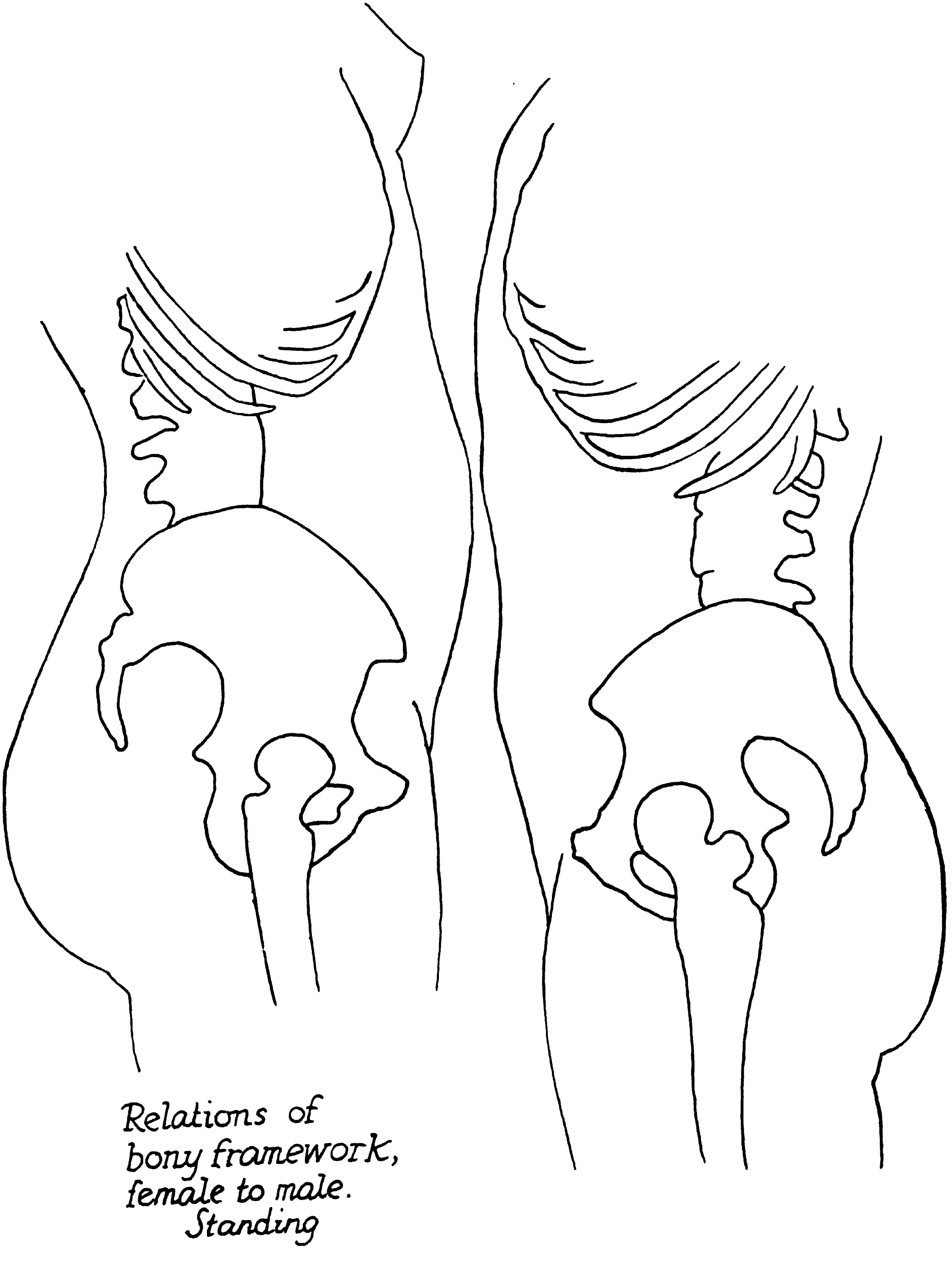
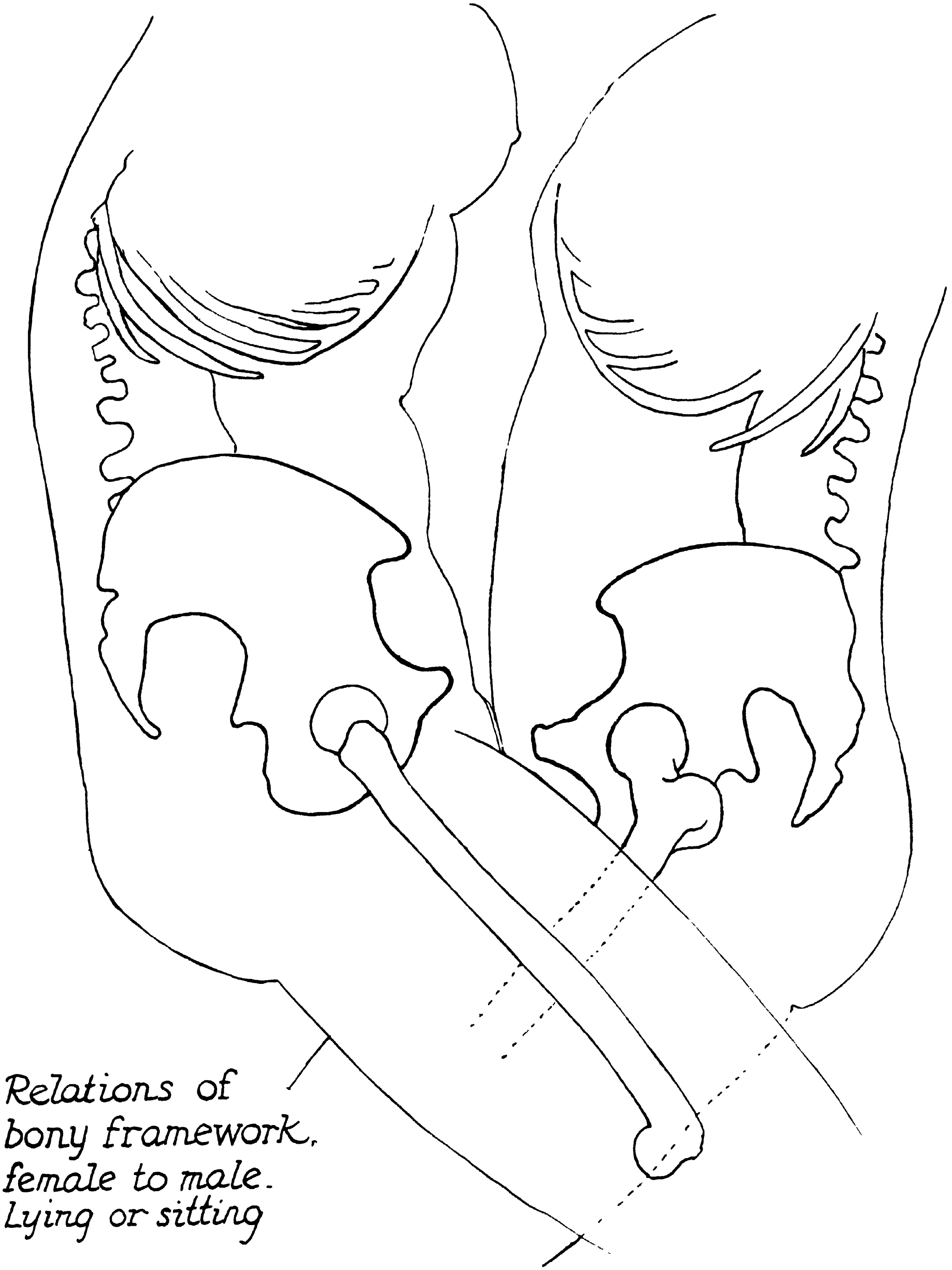

SMITH PESSARY
& RELATION
TO LEVATOR
L
L = anterior edge of levator
Levator
A.
SMITH PESSARY
IN COITUS.
ovary
B
DYSPAREUNIA
FROM
DISPLACED OVARY
Normal Entrance
fossa navicularis
Direction of
Perforation
into Rectum
Penis drives through
pelvic floor into rectum
S
vulva
urethra
cervix
vagina
Rectum
perineal body
Rectum
Anus
coccyx
C.
Left lateral fornix
pocketting the glans
Dots = range of
elasticity of vagina
in digital examination
D

Fig. 149



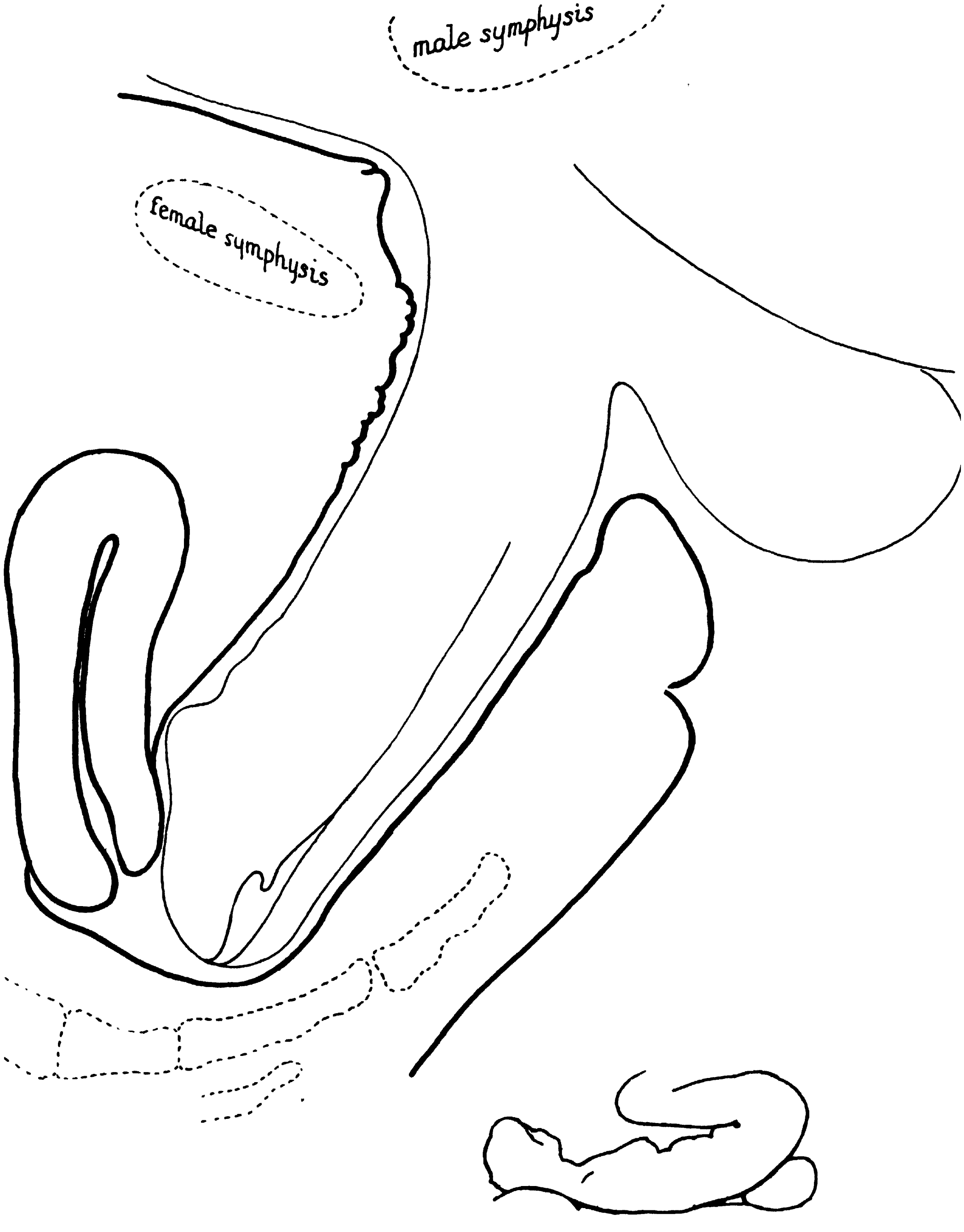
Relations of
bony framework,
female to male.
Standing

Fig. 150



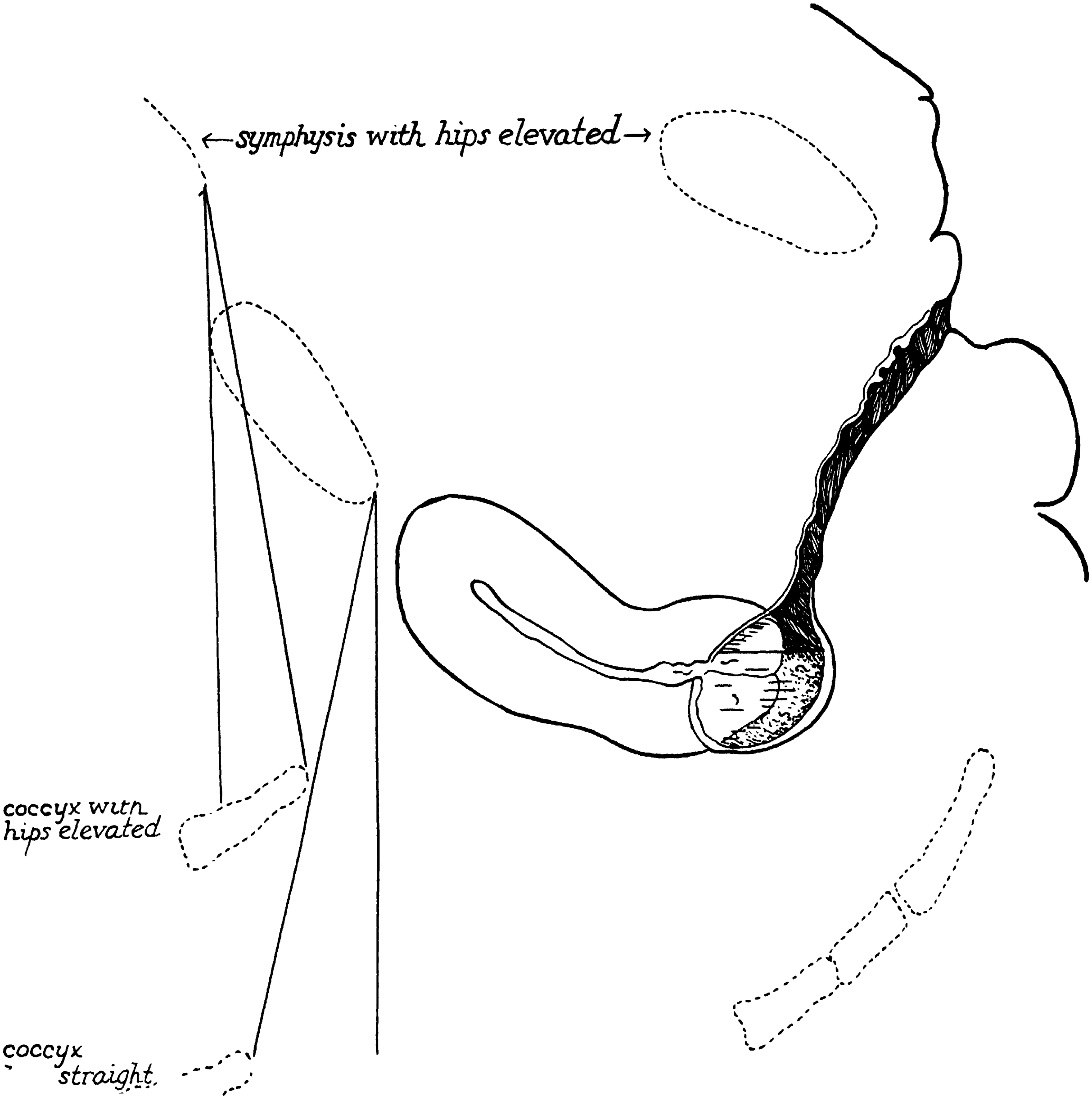
Relations of
bony framework,
female to male.
Lying or sitting

Fig. 151



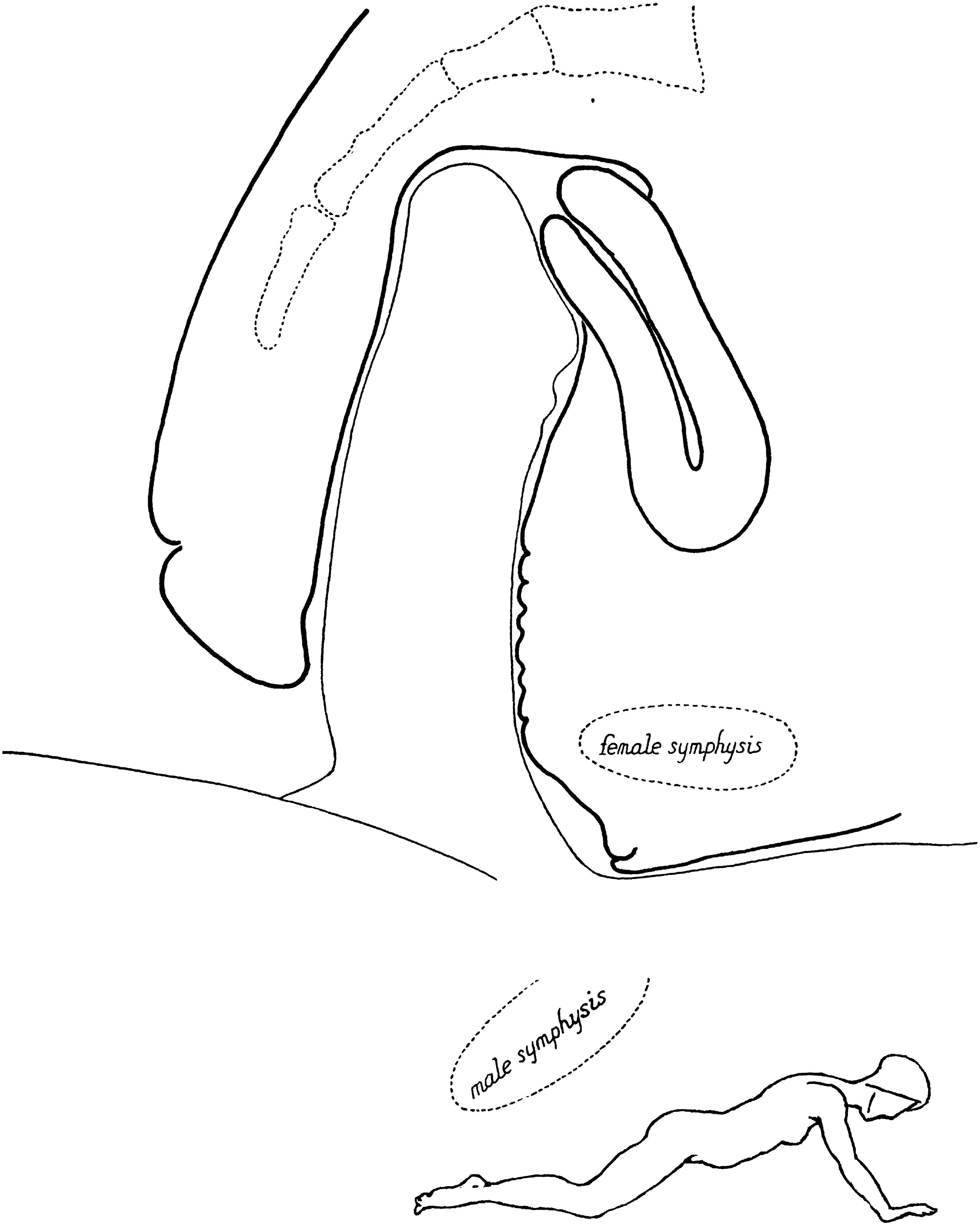
Coitus with elevated hips; thighs against abdomen.
Full reach & clitoris seizure. Steepest vagina.

Fig. 152a



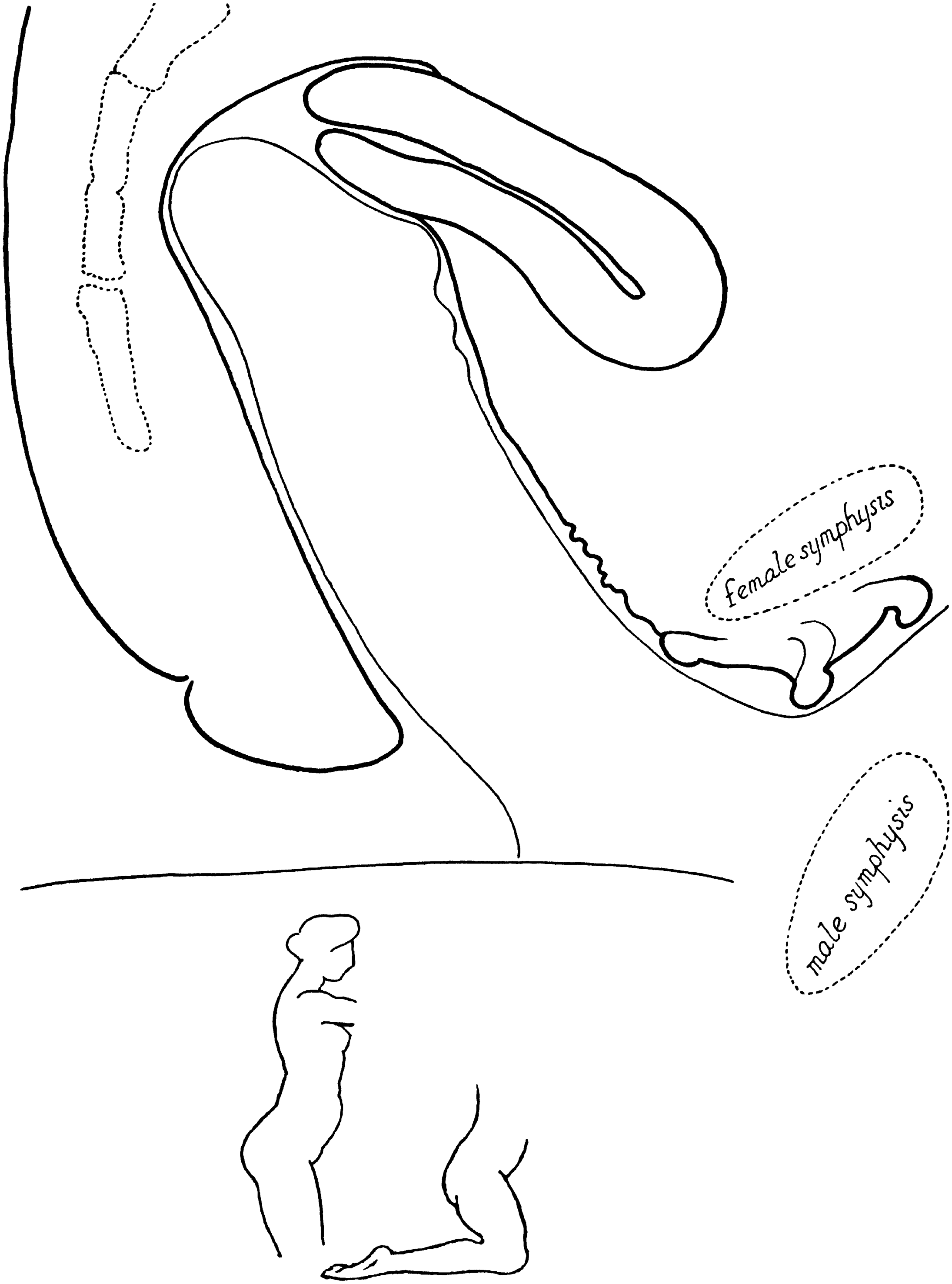
Pool of semen best retained in this posture.

Fig. 152b



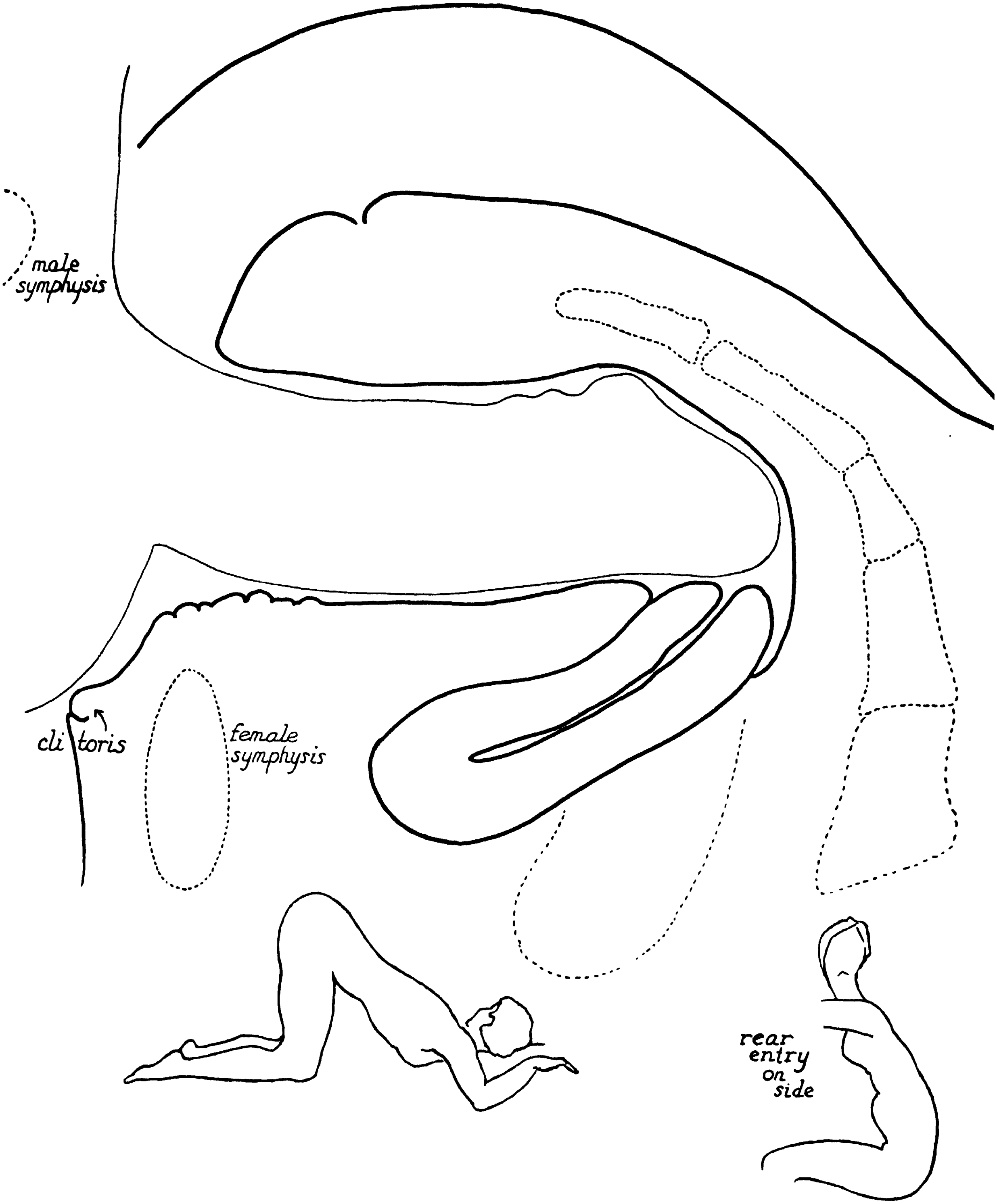
Coitus, woman lying above and regulating clitoris pressure and penetration

Fig. 153



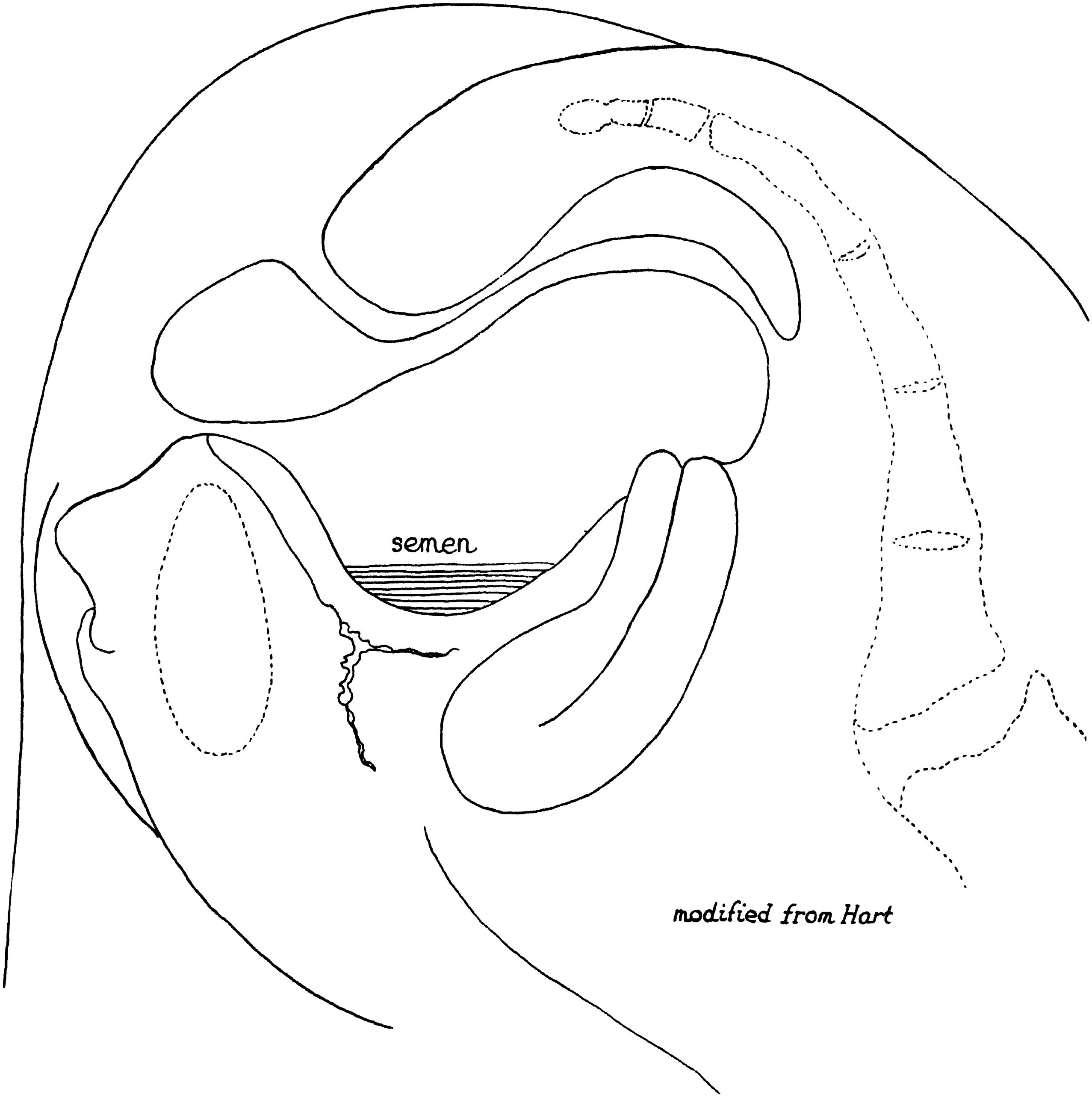
Coitus, woman sitting across his Knees.

Fig. 154



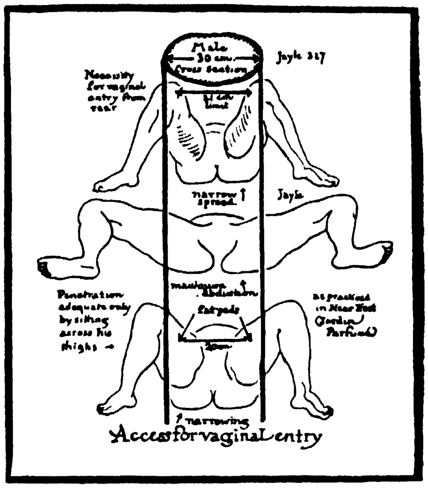
Coitus, knee-chest posture, vagina level.

Fig 155

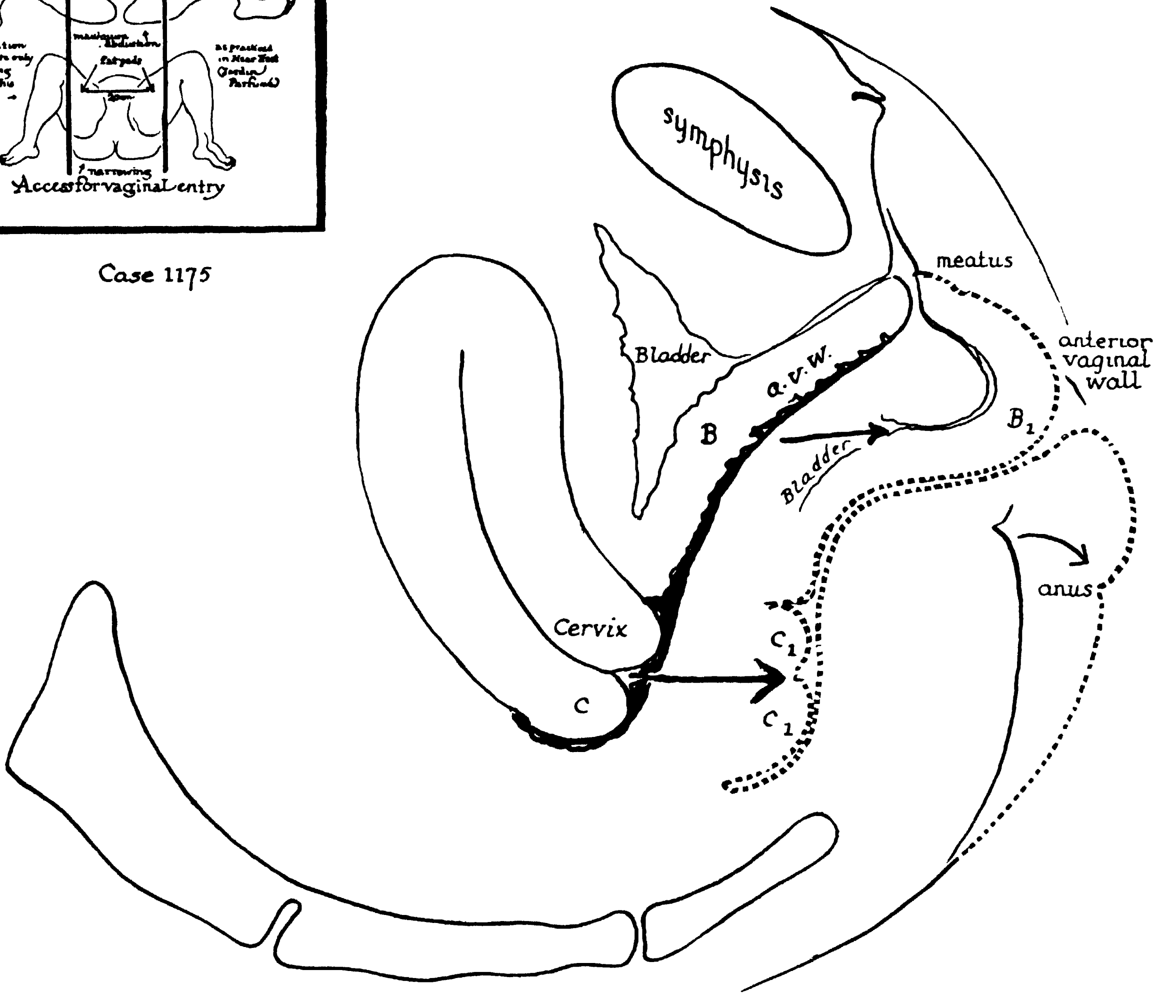


Post-coital conditions in Knee-chest posture.
Semen pool does not bathe cervix.

Fig. 156


Male
30 cm.
cross section
Jayle 117
Necessity for vaginal entry from rear
narrow spread
Jayle
maximum abduction
fat pads
20cm
Penetration adequate only by sitting across his thighs →
as practised in Near East (Garden Perfumed)
narrowing
Access for vaginal entry

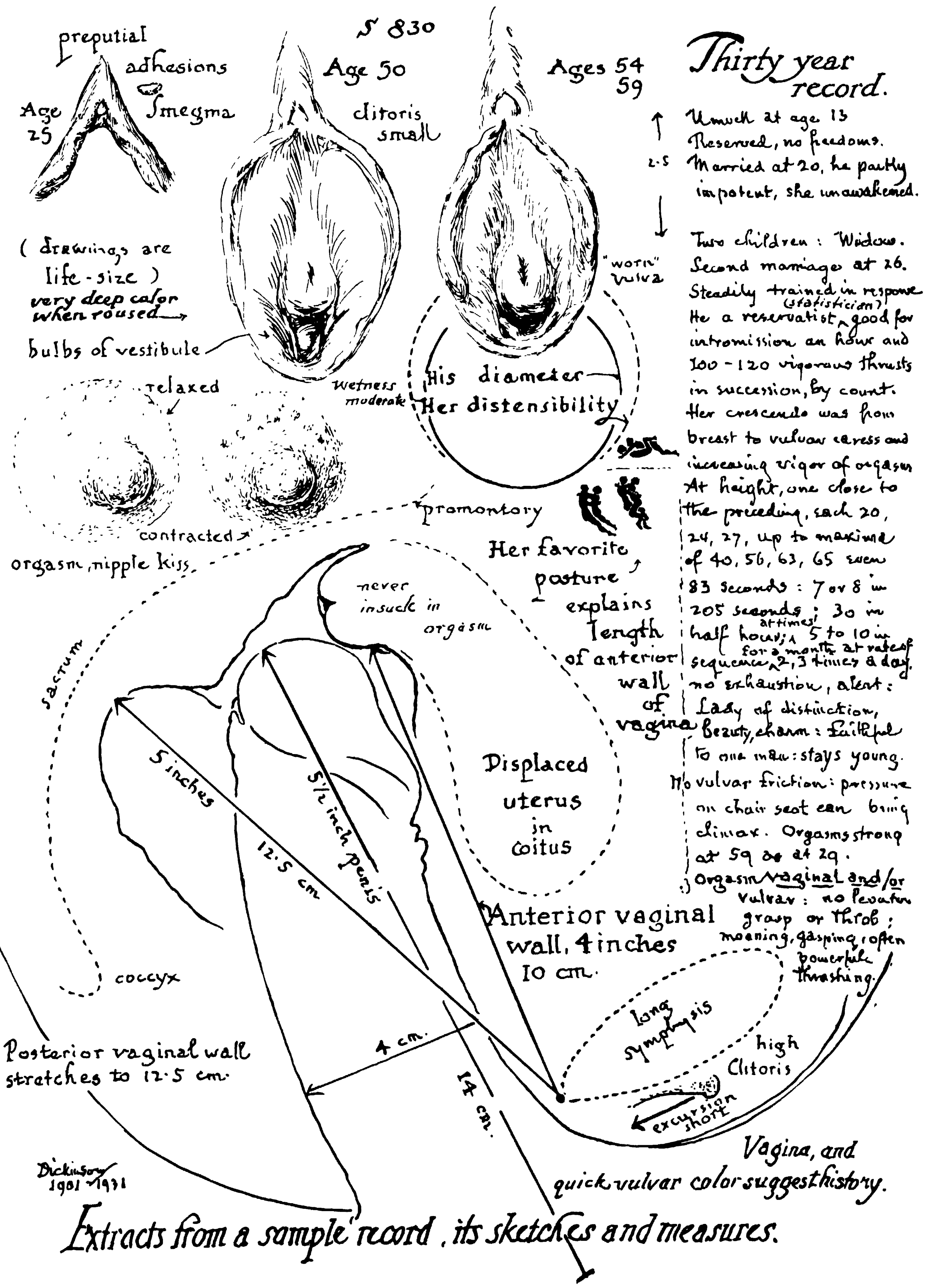
Case 1175



37 years. active; 2 children. orgasm by this means only:- chest set, abdominal muscles fixed. diaphragm drives hard down. twice a second, with pauses. Total of 83 thrusts. Cervix moves back + forward one inch. also bladder and anterior vaginal wall.

Range of displacement when orgasm is induced by violent, rhythmic straining, with Descent of Uterus

Fig. 157



(drawings are life-size)

Thirty year record.

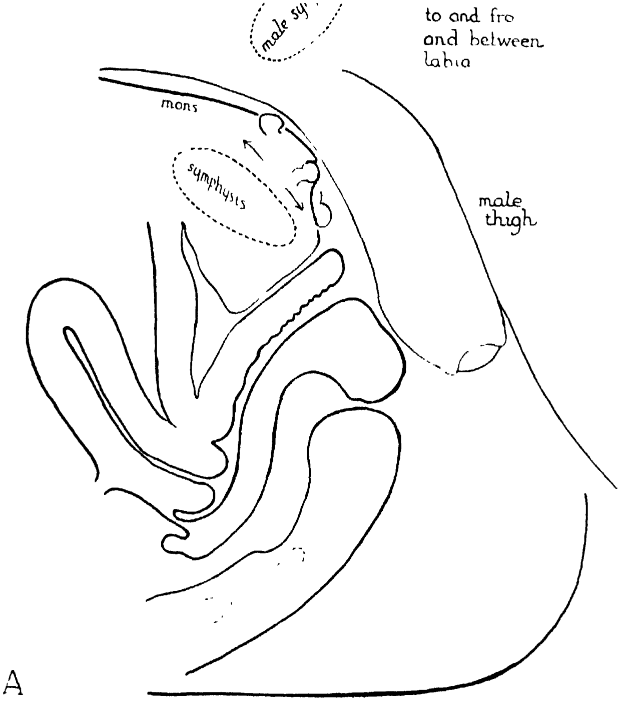
Unmoved at age 13
Reserved, no freedoms.
Married at 20, he partly impotent, she unawakened.

Two children: Widow. Second marriage at 26. Steadily trained in response. He a reservatist (statistician) good for intromission an hour and 100-120 vigorous thrusts in succession, by count. Her crescendo was from breast to vulvar caress and increasing vigor of orgasm. At height, one close to the preceding, each 20, 24, 27, up to maxima of 40, 56, 63, 65 even 83 seconds: 7 or 8 in 205 seconds: 30 in half hour; at times 5 to 10 in sequence, for a month at rates of 2, 3 times a day. no exhaustion, alert: Lady of distinction, Beauty, charm: Faithful to one man: stays young. No vulvar friction: pressure on chair seat can bring climax. Orgasms strong at 59 as at 29. Orgasm vaginal and/or vulvar: no levator grasp or throb; moaning, gasping, often powerful thrashing.

Vagina, and quick vulvar color suggest history.

Extracts from a sample record, its sketches and measures.

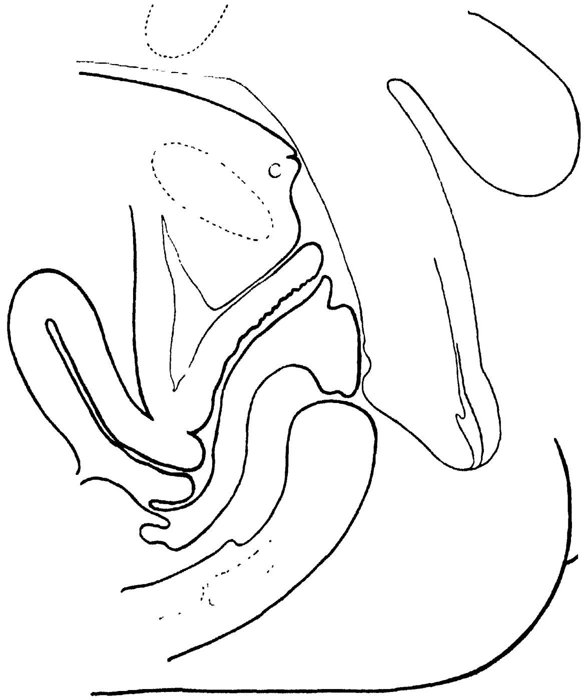
Fig. 158



Pressure is on clitoris to and fro and between labia

Coitus for the impotent with vulvar orgasm

Fig. 159a



Intra-femoral coitus, no penetration of hymen

Fig. 159b

CHAPTER VIII

THE ANATOMY OF THE CONTROL OF CONCEPTION

Text and commentary pages 110 to 116
Figures 160 to 175

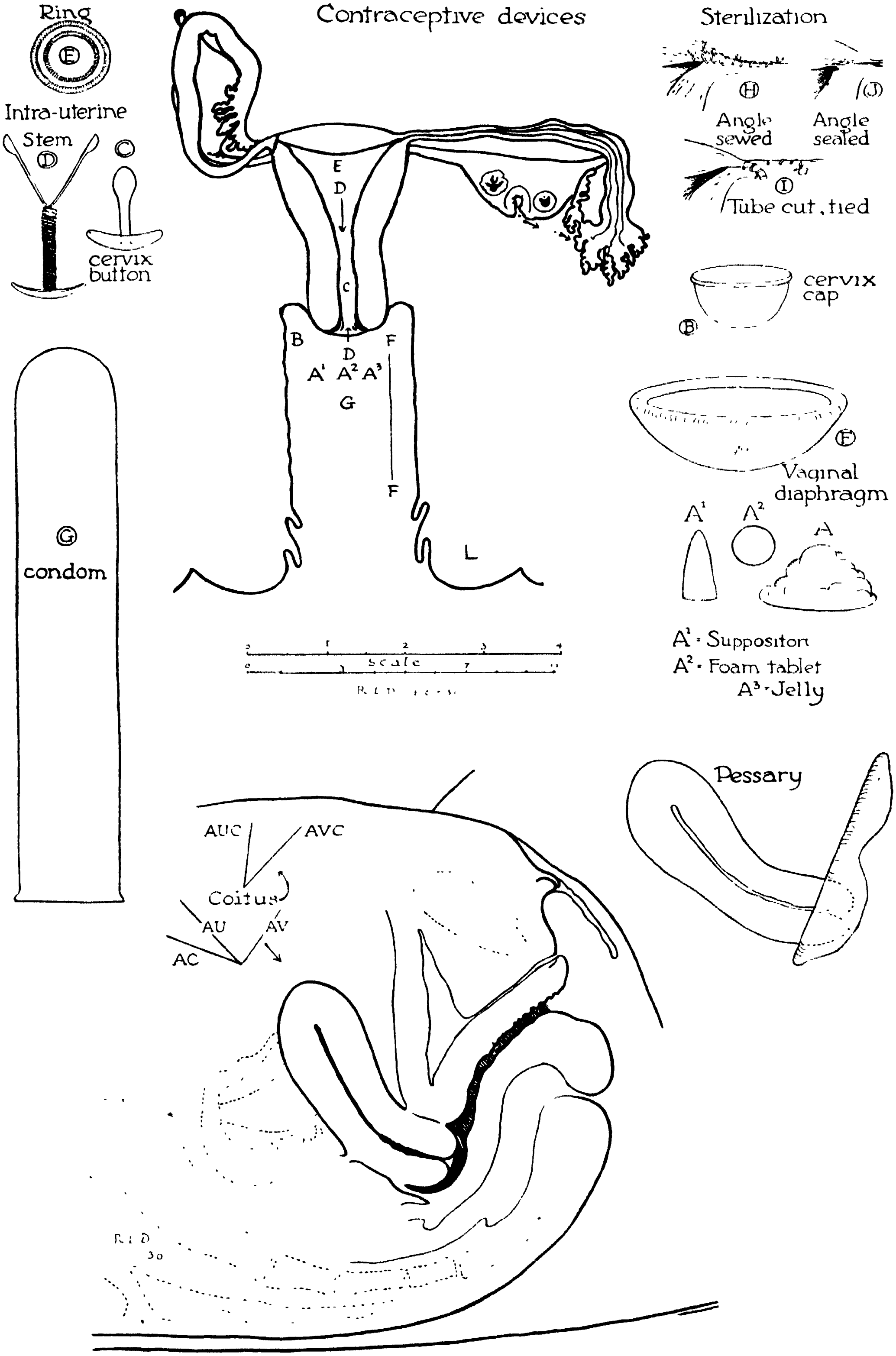
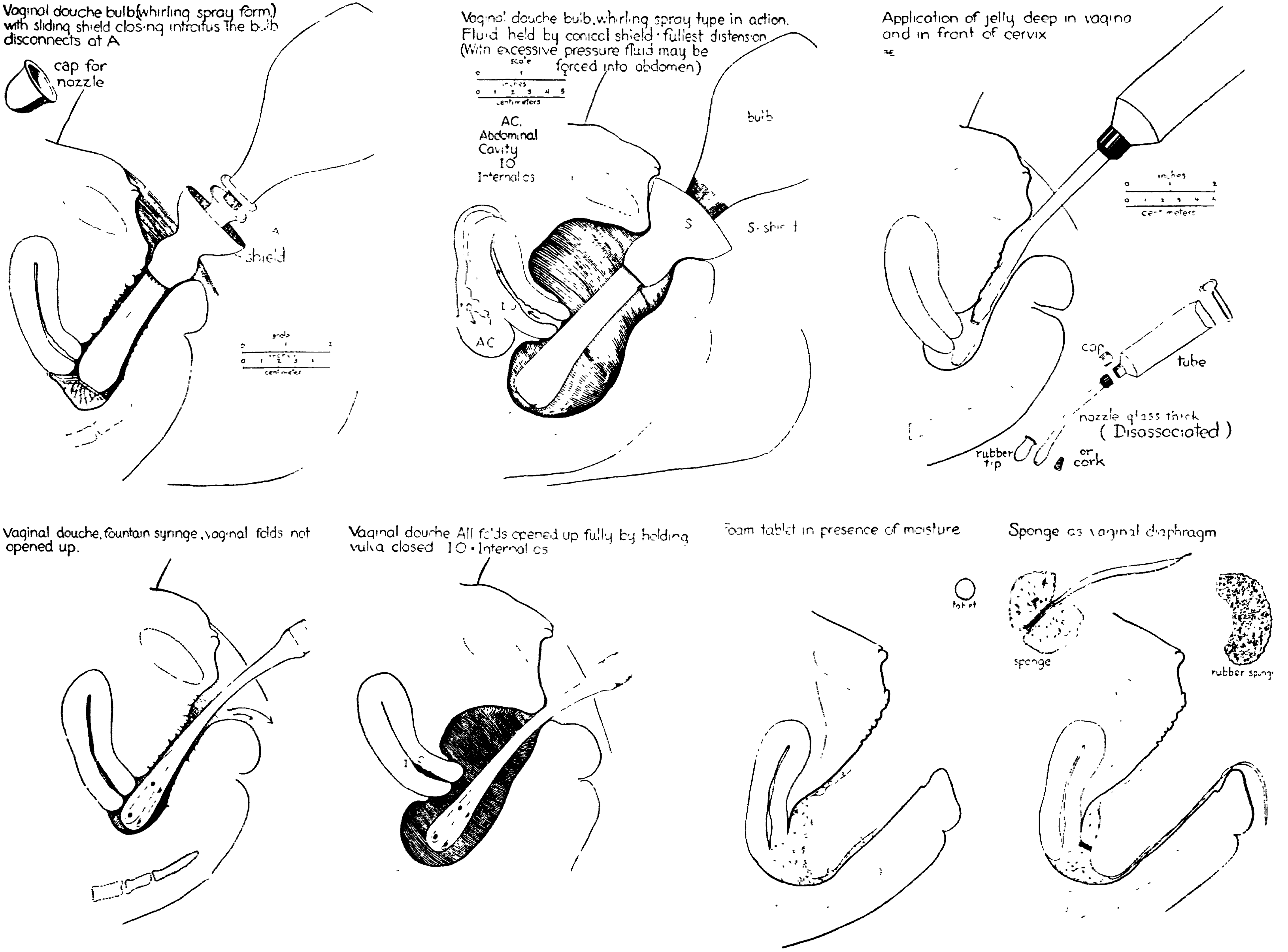

Contraceptive devices
Sterilization
Ring
Ⓔ
Intra-uterine
Stem
Ⓓ
Ⓒ
cervix button
Ⓗ
Angle sewed
Ⓙ
Angle sealed
Ⓘ
Tube cut, tied
E
D
C
B
D
F
A¹ A² A³
G
F
L
cervix cap
Ⓑ
Ⓕ
Vaginal diaphragm
A¹
A²
A
Ⓖ
condom
scale
A¹ - Suppositori
A² - Foam tablet
A³ - Jelly
Pessary
AUC
AVC
Coitus
AU
AV
AC
R L D
30

Fig. 160

Fig. 161



Vaginal douche bulb (whirling spray form) with sliding shield closing introitus The bulb disconnects at A

Vaginal douche bulb, whirling spray type in action. Fluid held by conical shield · fullest distension (With excessive pressure fluid may be forced into abdomen)

AC. Abdominal Cavity
IO Internal os

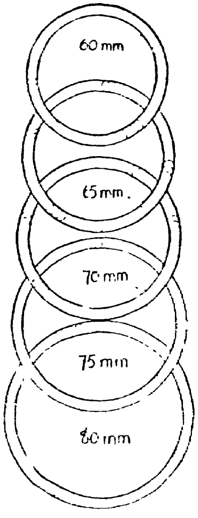
Application of jelly deep in vagina and in front of cervix

Vaginal douche, fountain syringe, vaginal folds not opened up.

Vaginal douche All folds opened up fully by holding vulva closed IO · Internal os

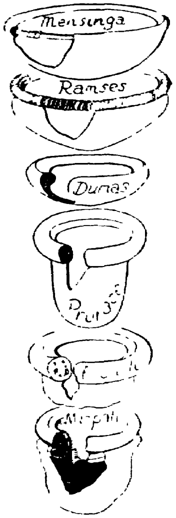
Foam tablet in presence of moisture

Sponge as vaginal diaphragm

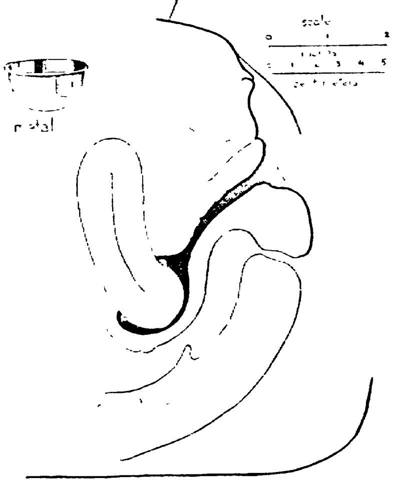


Measuring Rings

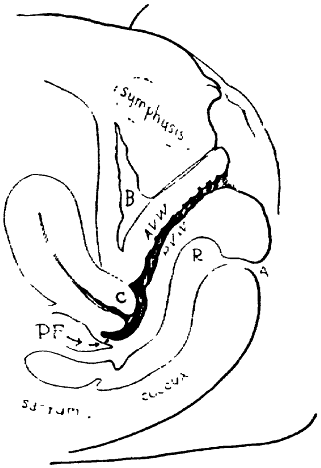
Pessaries



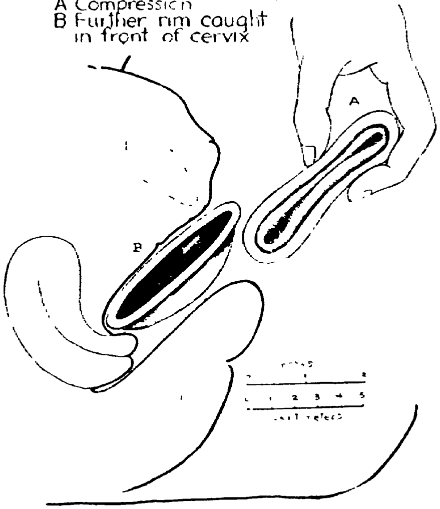
Pelvis with metal cap, from side (also celluloid)



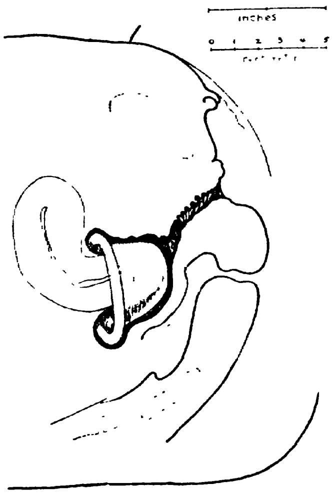
Anatomy in usual posture of placing pessary
AVW ant vaginal wall
PF post fornix C cervix



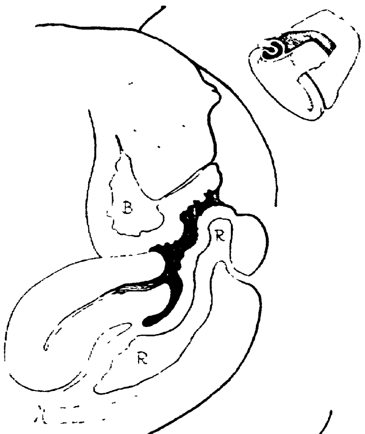
Introduction of pessary
A Compression
B Further rim caught in front of cervix



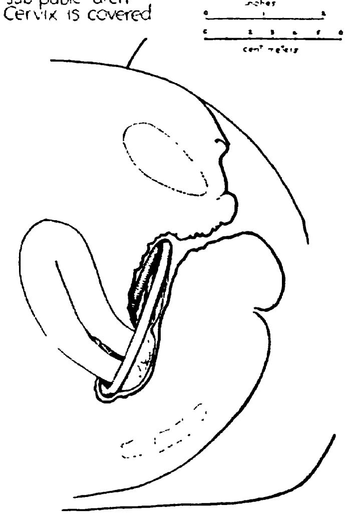
Prorace pessary, with cervix anteverted



Retroversion (cervix low) or vagina relaxed, or perineum torn call for cervix-cap



Correct placing of pessary,
Anterior bar well caught behind sub pubic arch
Cervix is covered



Finger makes sure that cervix is cupped by rubber dome by bearing down

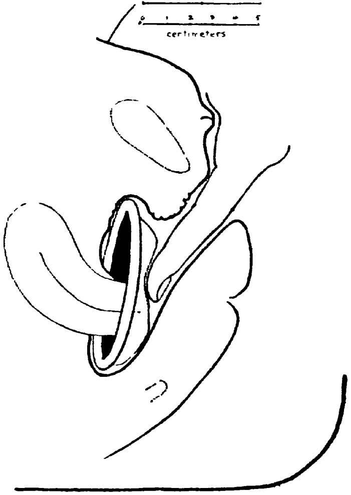
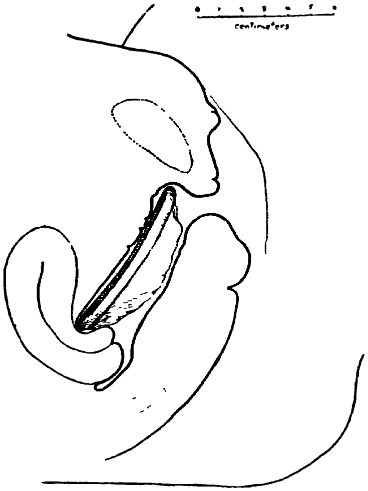
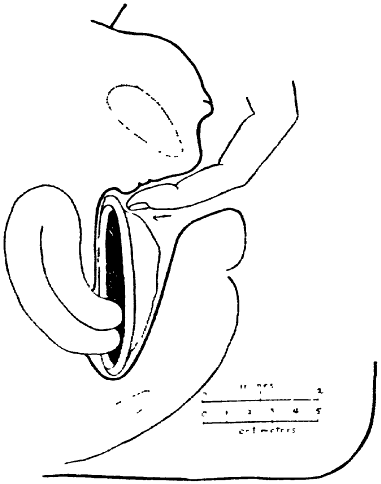
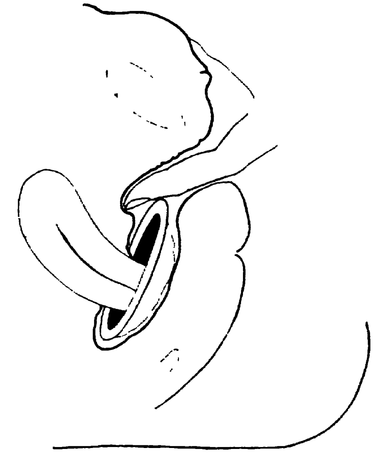
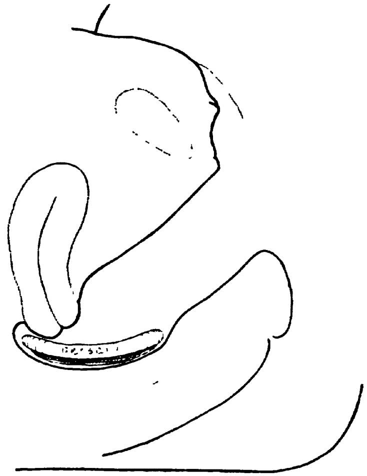


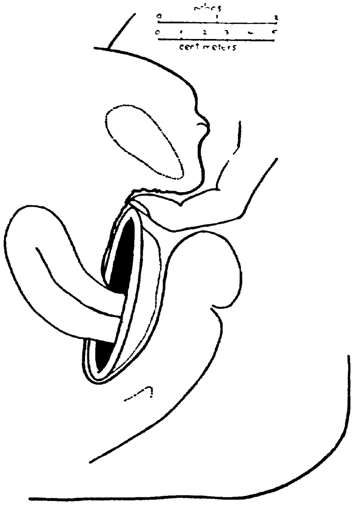
Fig. 163

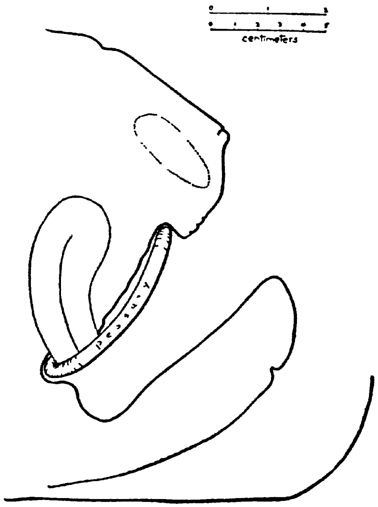

Incorrect placing of pessary
Cervix is not covered

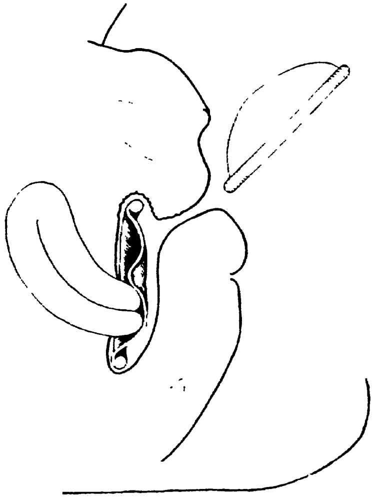

Dislodging further rim to jump over cervix by finger-tip pressure in direction of arrow

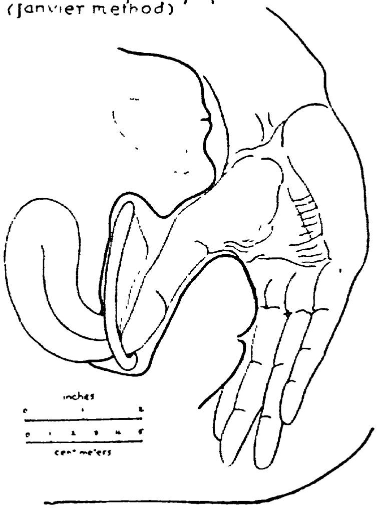

Test by passing finger along anterior vaginal wall Defective fit, too small a pessary


With too small a pessary passage is possible along anterior wall


Test attempt to pass finger-tip along anterior vaginal wall Fails with proper fit


Correct placing of pessary and its position during coitus


Pessary in place with dome upward

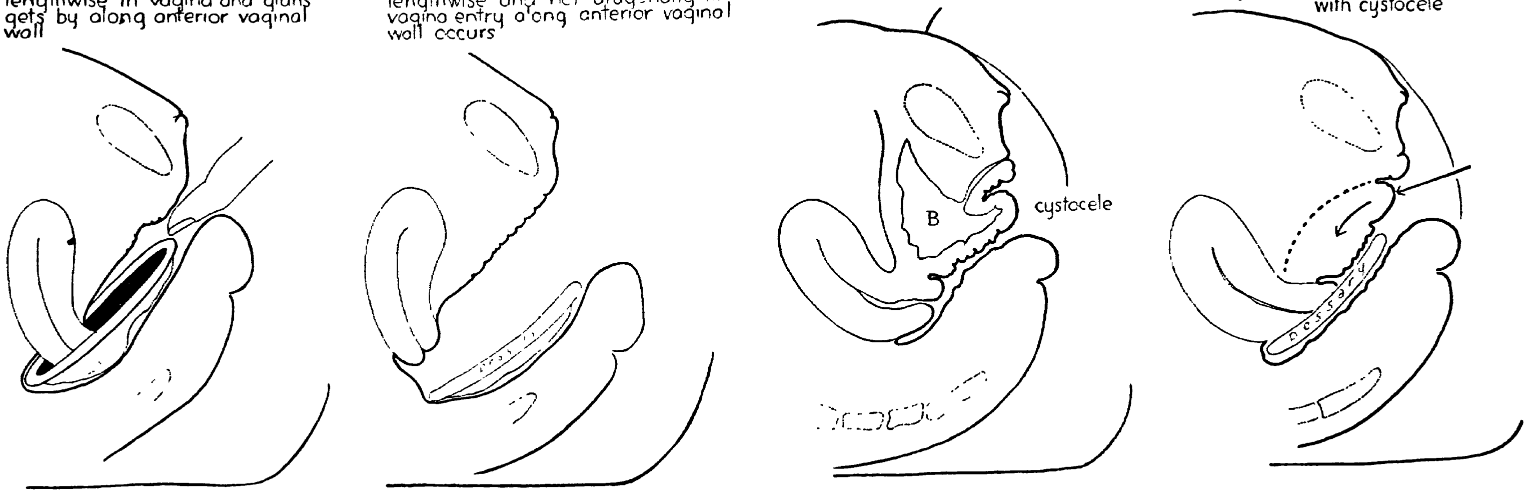

Dislodging further rim to pass the cervix by using tip of thumb (Janvier method)

Too large a pessary lies lengthwise in vagina and glans gets by along anterior vaginal wall

With too large a pessary, lying lengthwise and not diagonally in vagina entry along anterior vaginal wall occurs

Cystocele, uterus & bladder low

Mensinga, Ramses fail to prevent entry of phallus along front wall with cystocele



nsertion of pessary
/ith aid of director of M Mayer

Cross section of body showing director placing furthermost part of circle of pessary beyond cervix

Cystocele calls for pessary lifting anterior vaginal wall Reversed Smith covered with condom

Reversed Smith or Matrisalus during coitus

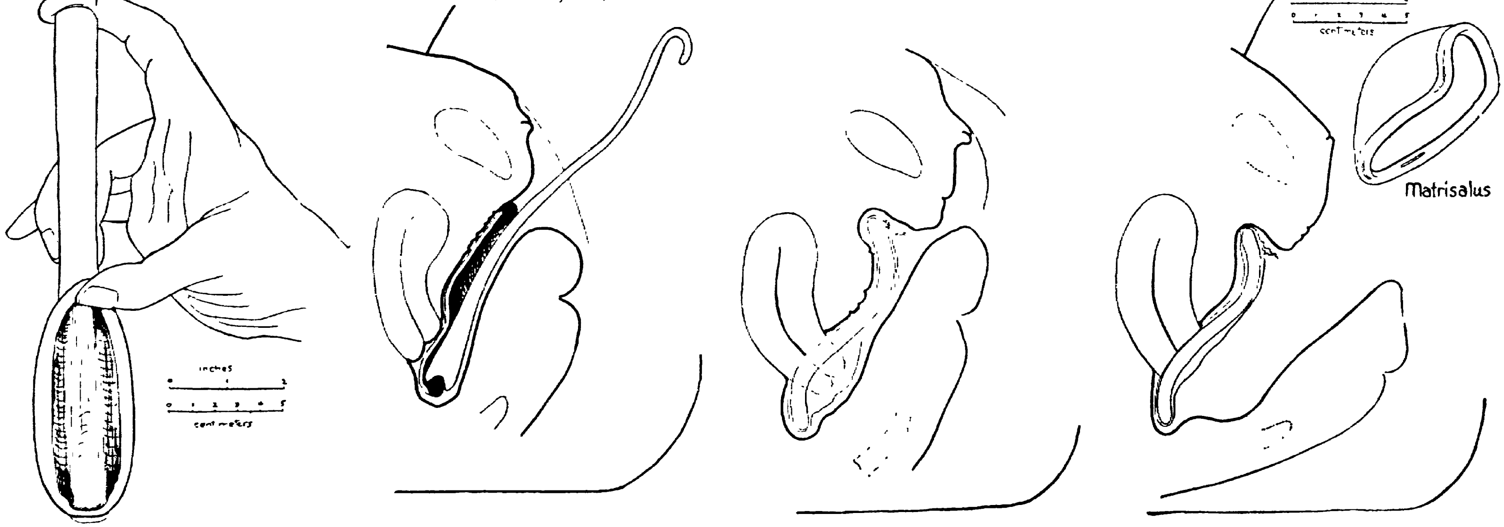
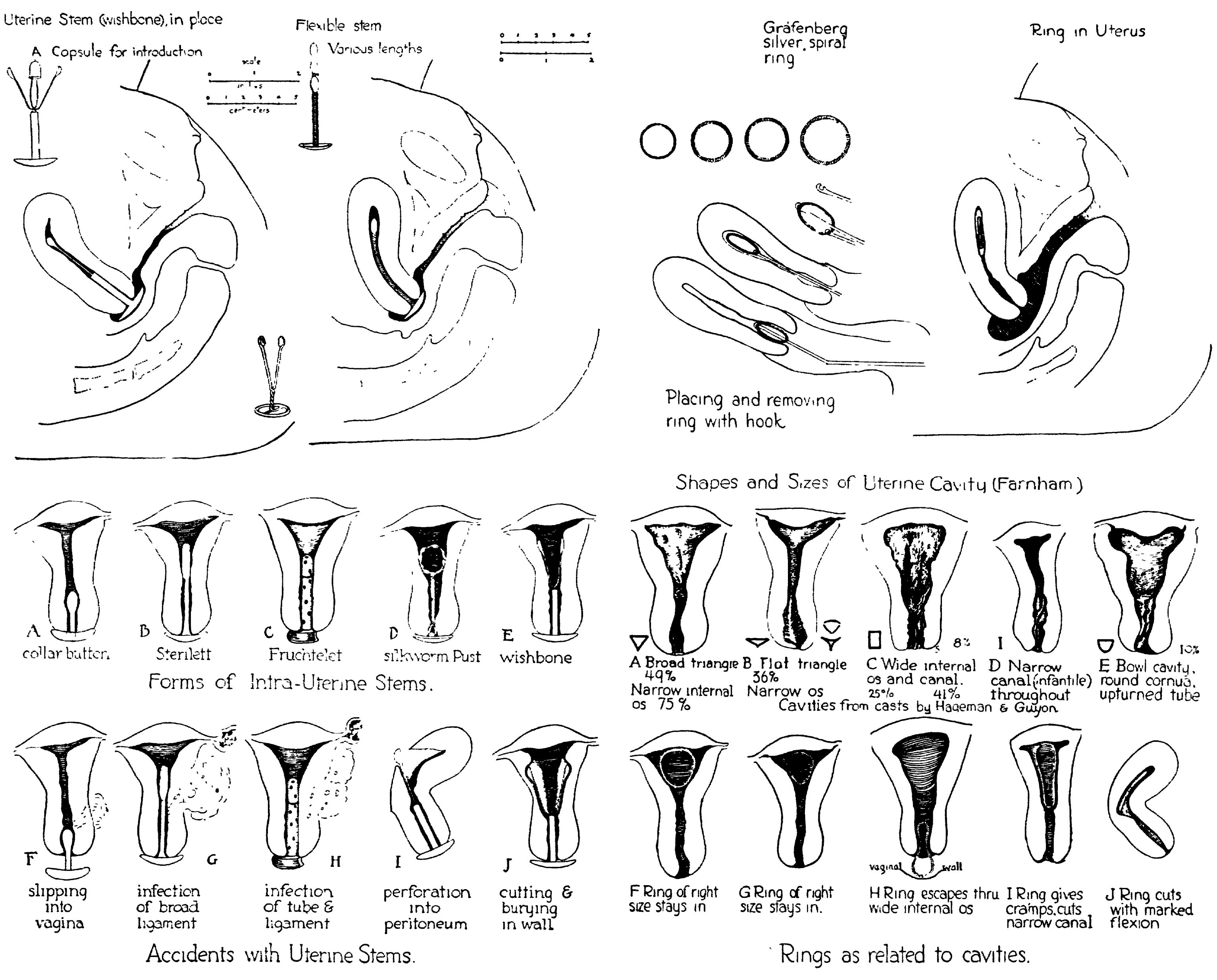


Fig. 164

Fig. 165


Uterine Stem (wishbone), in place
A Capsule for introduction
scale
inches
centimeters
Flexible stem
Various lengths
Gräfenberg silver, spiral ring
Ring in Uterus
Placing and removing ring with hook
Shapes and Sizes of Uterine Cavity (Farnham)
A collar button
B Sterilett
C Fruchtelet
D silkworm Pust
E wishbone
Forms of Intra-Uterine Stems.
A Broad triangle 49%
Narrow internal os 75%
B Flat triangle 36%
Narrow os
C Wide internal os and canal. 25% 41%
8%
D Narrow canal (infantile) throughout
E Bowl cavity, round cornua, upturned tube
10%
Cavities from casts by Hageman & Guyon
F slipping into vagina
G infection of broad ligament
H infection of tube & ligament
I perforation into peritoneum
J cutting & burying in wall
Accidents with Uterine Stems.
F Ring of right size stays in
G Ring of right size stays in.
H Ring escapes thru wide internal os
vaginal wall
I Ring gives cramps, cuts narrow canal
J Ring cuts with marked flexion
Rings as related to cavities.

BAL INSUFFLATION
y glass tube and air bulb

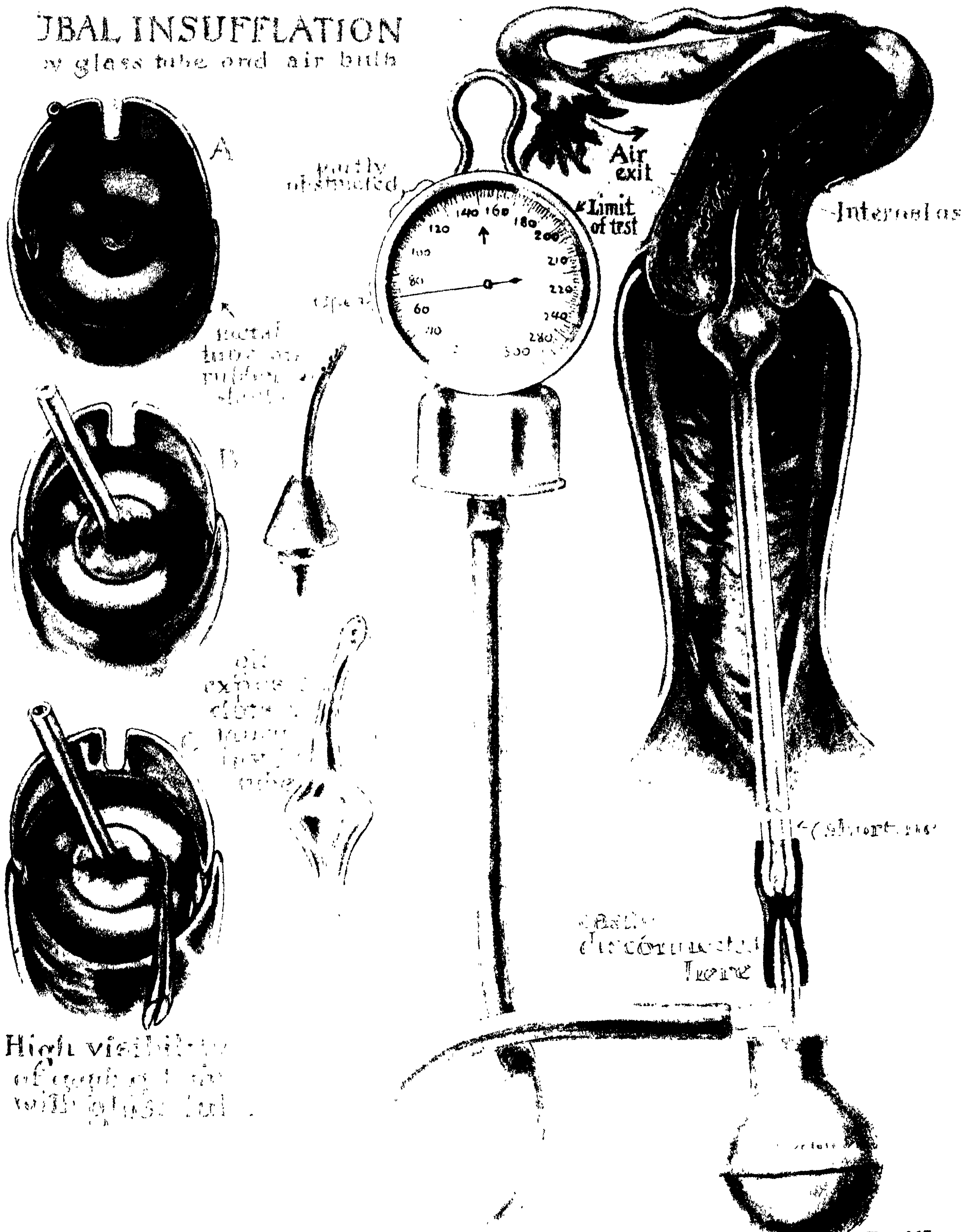
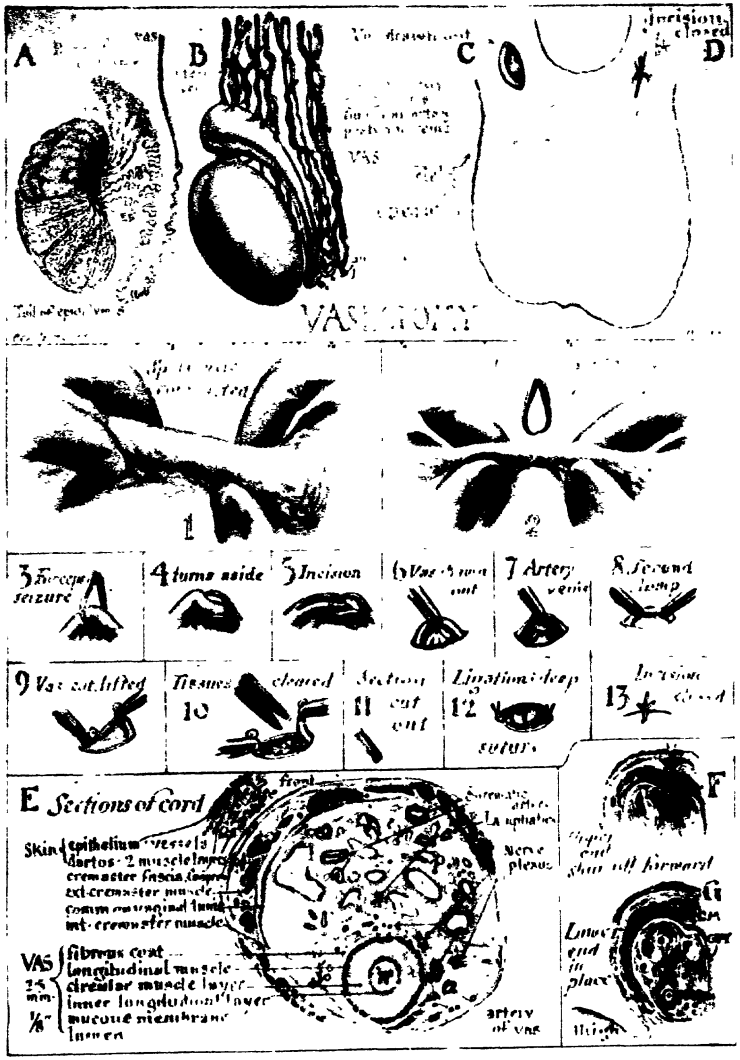
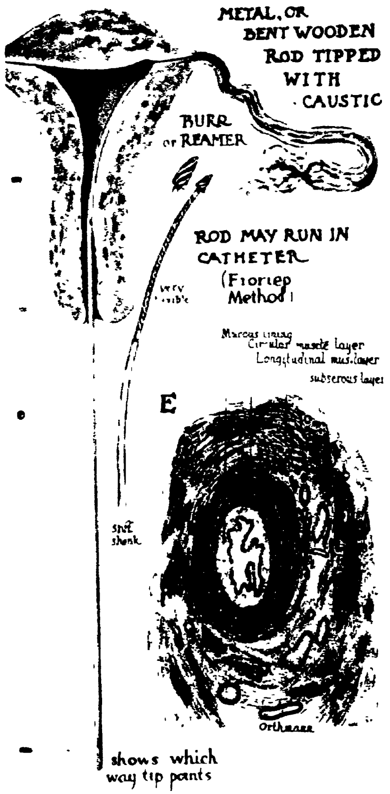


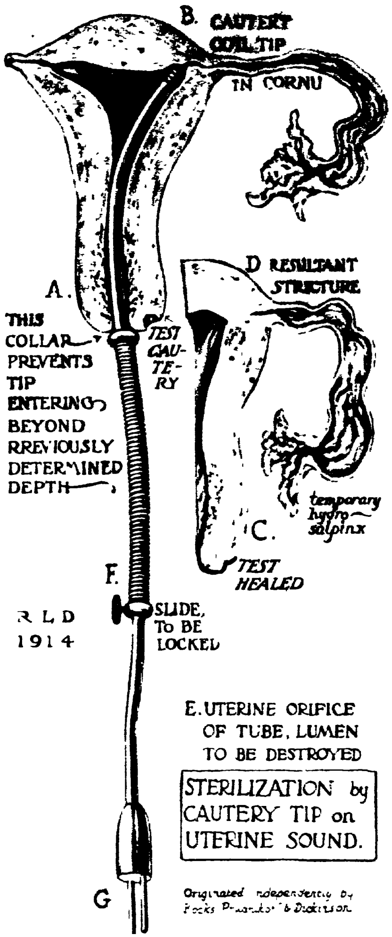
Fig. 165a

Fig. 166





Sterilization by office treatment; stricture produced by burn, slough, & circular scar.



E. UTERINE ORIFICE OF TUBE, LUMEN TO BE DESTROYED

STERILIZATION by CAUTERY TIP on UTERINE SOUND.

Originated independently by Rocks Preandoff & Dickinson.

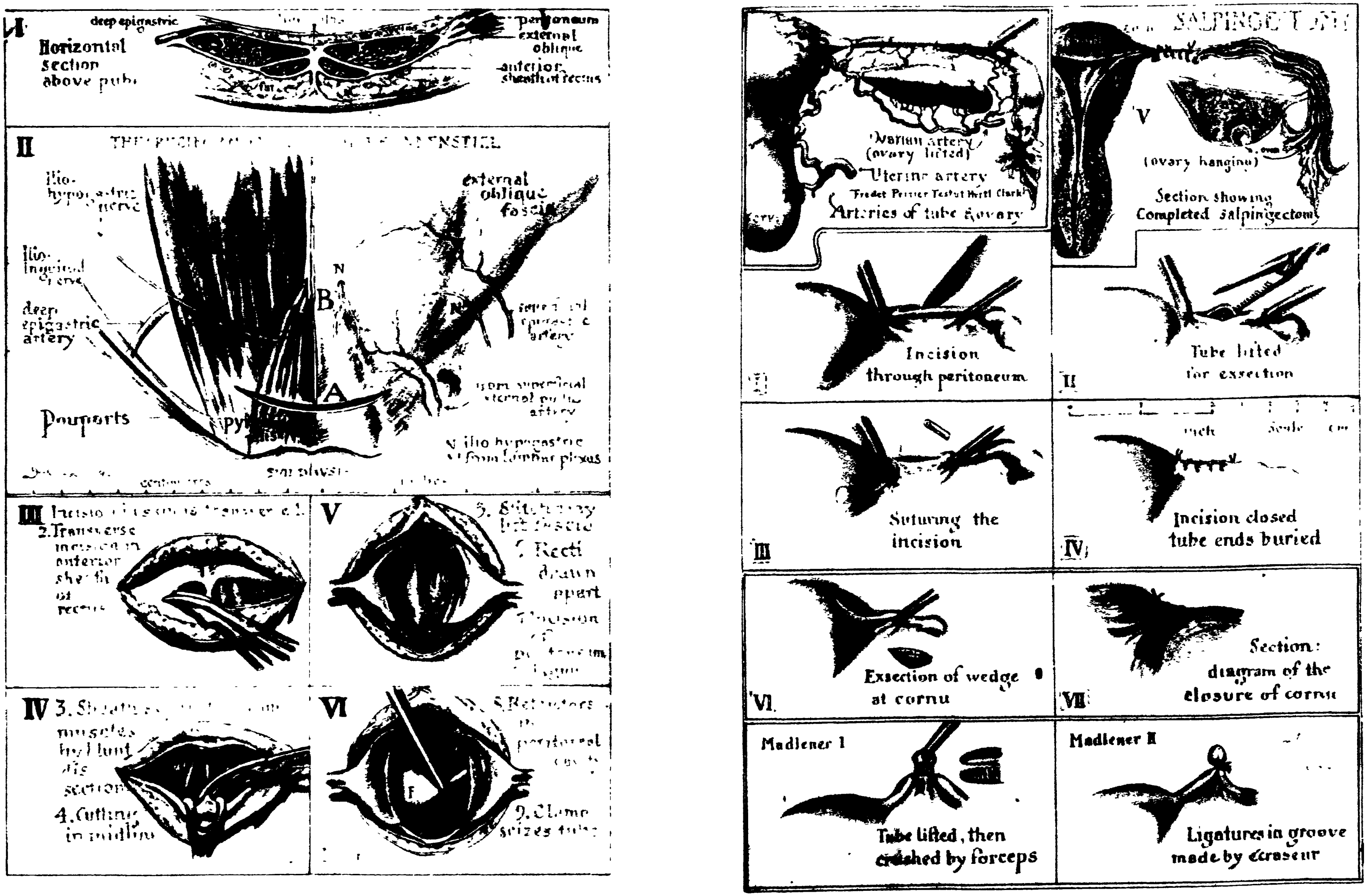
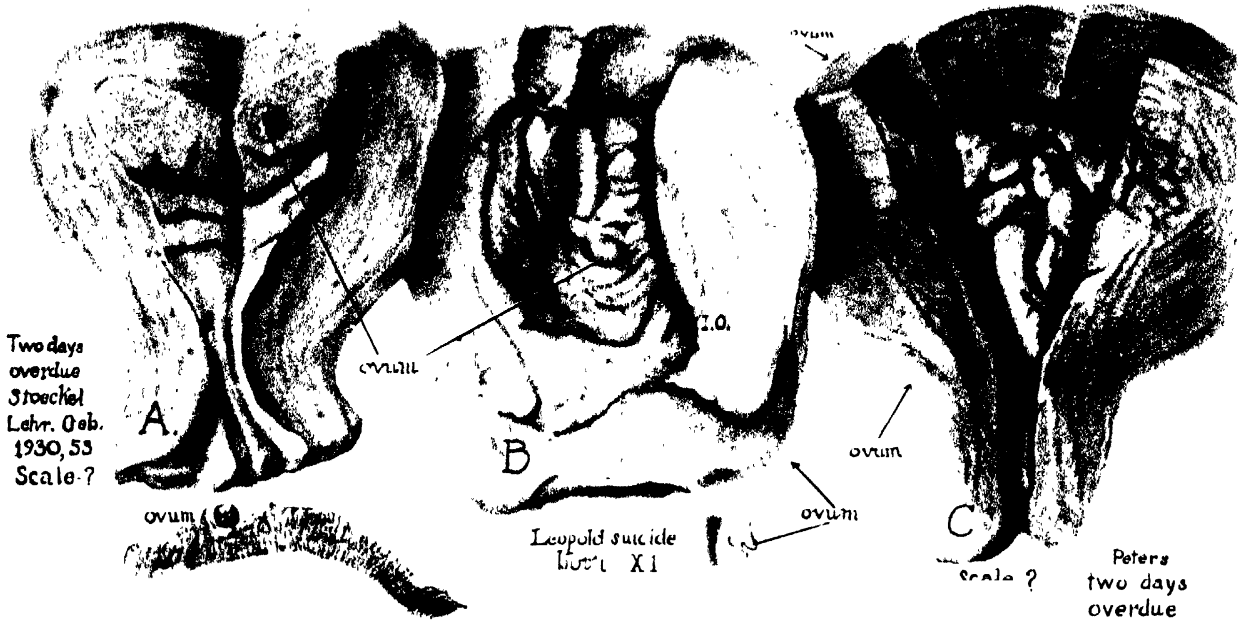

I
deep epigastric
peritoneum
external oblique
anterior sheath of rectus
Horizontal section above pubis
II
Ilio-hypogastric nerve
Ilio-inguinal nerve
deep epigastric artery
Pouparts
external oblique fascia
N
B
A
Py
symphysis
ilio hypogastric from lumbar plexus
III
2. Transverse incision in anterior sheath of rectus
V
5. Stitch
6. Recti drawn apart
IV
3.
4. Cutting in midline
VI
8. Retractors
9. Clamp seizes tube
F
SALPINGECTOMY
Ovarian artery (ovary lifted)
Uterine artery
Arteries of tube & ovary
V
(ovary hanging)
Section showing Completed salpingectomy
I
Incision through peritoneum
II
Tube lifted for excision
III
Suturing the incision
inch
Scale
cm
IV
Incision closed tube ends buried
VI
Exsection of wedge at cornu
VII
Section: diagram of the closure of cornu
Madlener I
Tube lifted, then crushed by forceps
Madlener II
Ligatures in groove made by écraseur

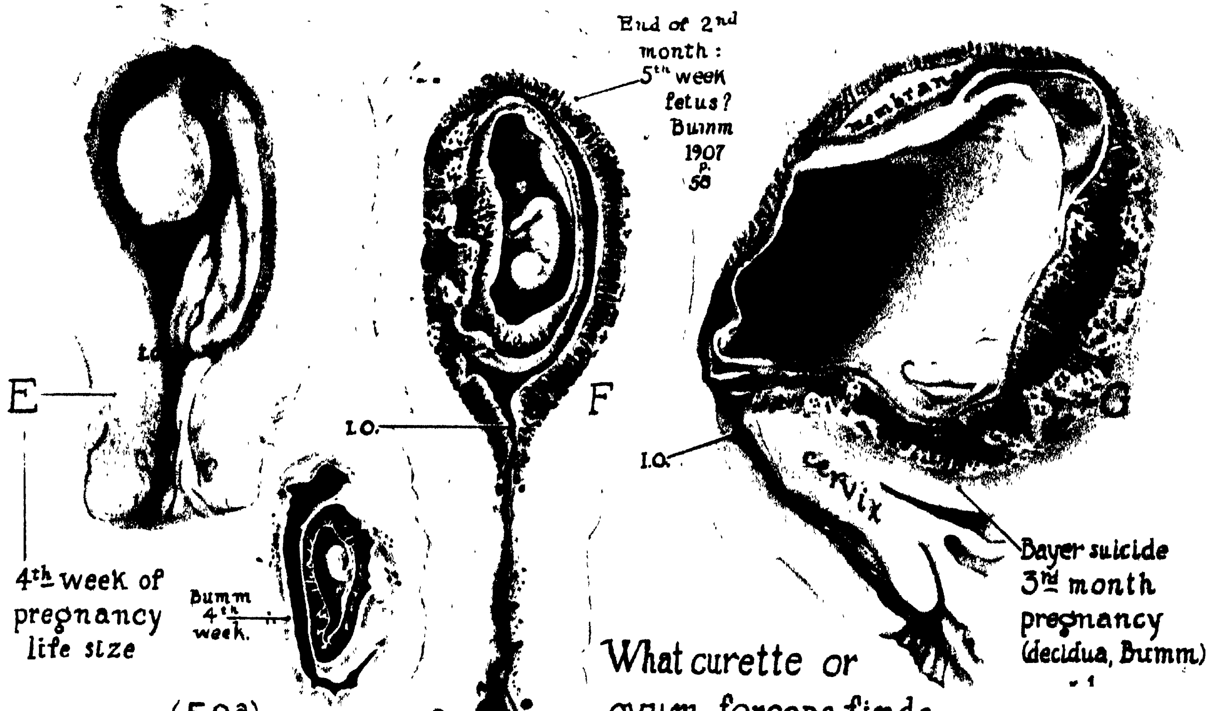
Fig. 167



2 to 8 mm.

59

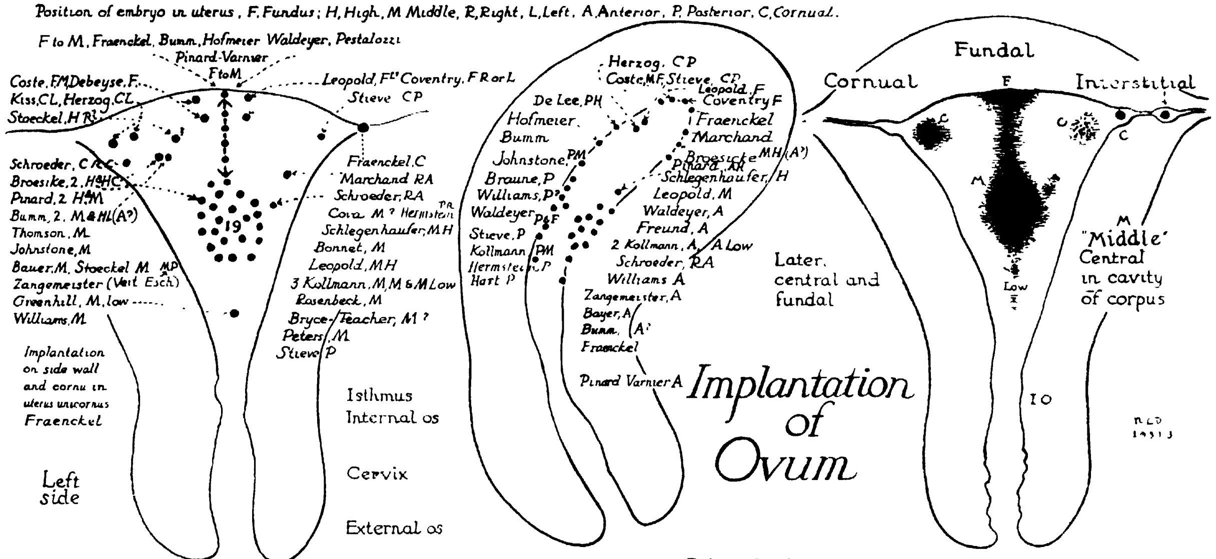
What the curette
finds i

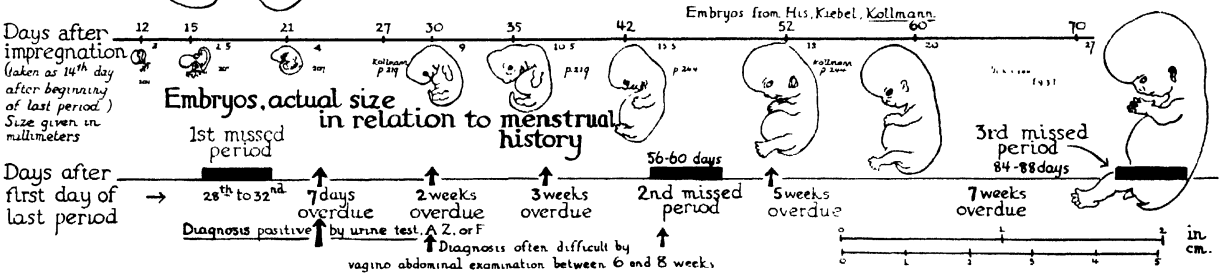


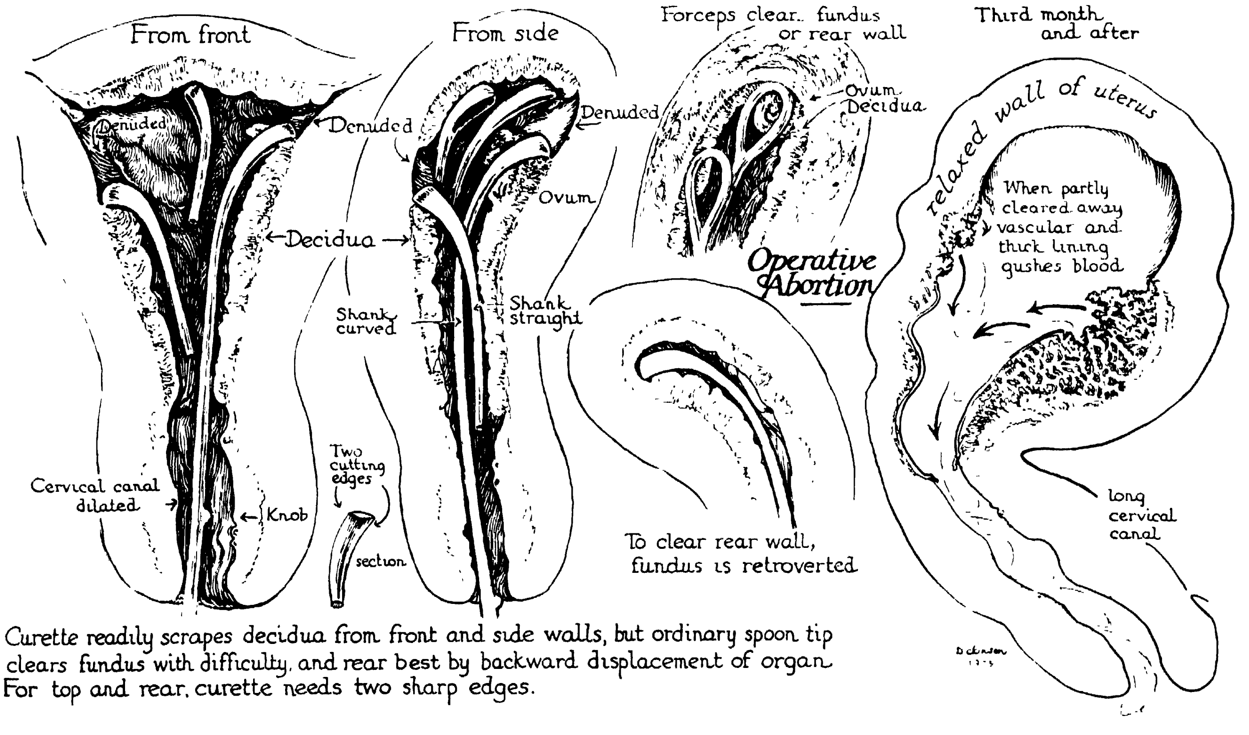
(59a)

What curette or
ovum forceps finds.

Fig. 168 - 169




Embryos from His, Kiebel, Kollmann.
Days after impregnation (taken as 14th day after beginning of last period) Size given in millimeters
12
15
21
27
30
35
42
52
60
70
2
2.5
4
9
10.5
13.5
18
20
27
Kollmann p 219
p 219
p 244
Kollmann p 244
Embryos, actual size in relation to menstrual history
1st missed period
56-60 days
3rd missed period 84-88 days
Days after first day of last period →
28th to 32nd
7 days overdue
2 weeks overdue
3 weeks overdue
2nd missed period
5 weeks overdue
7 weeks overdue
Diagnosis positive by urine test, A Z, or F
Diagnosis often difficult by vagino abdominal examination between 6 and 8 weeks
0
1
2
0
1
2
3
4
5
in cm.

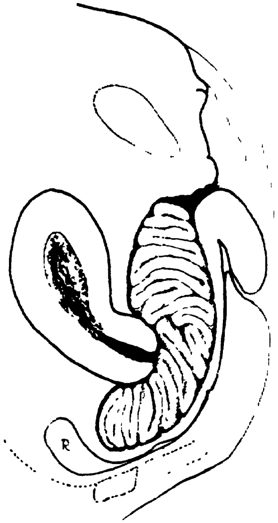


Curette readily scrapes decidua from front and side walls, but ordinary spoon tip clears fundus with difficulty, and rear best by backward displacement of organ. For top and rear, curette needs two sharp edges.

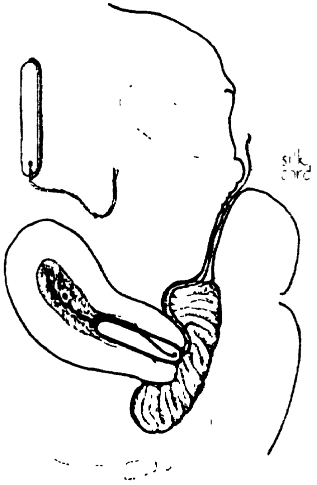
Fig. 169a

Fig. 170

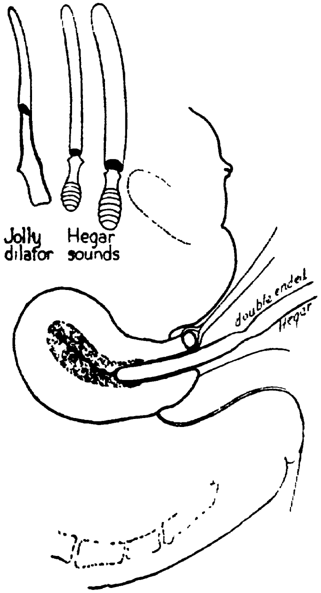
60 Tampon, firmly packed while in knee-chest posture



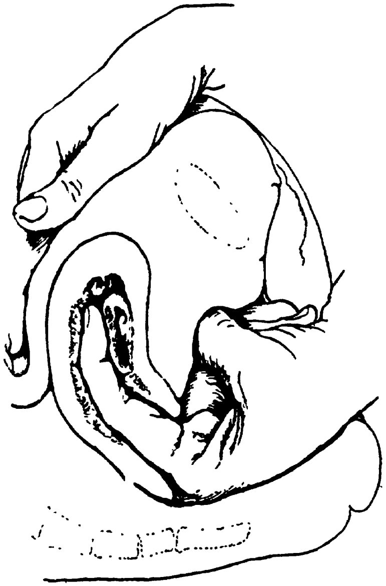
61 Dilation by laminaria tent



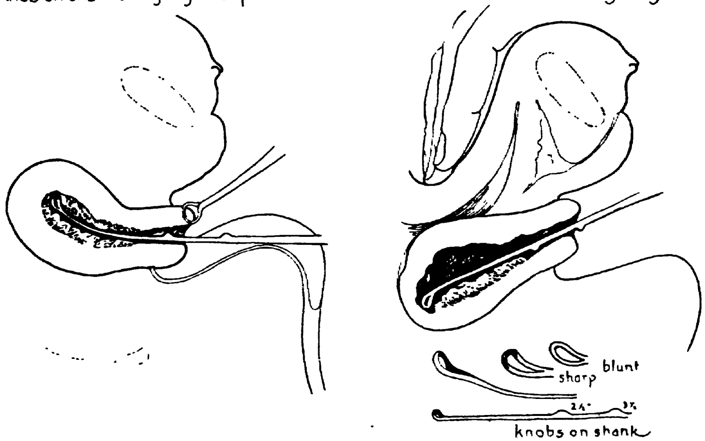
Abortion, preliminary dilation of cervix



62 Dilation by Hegar sounds

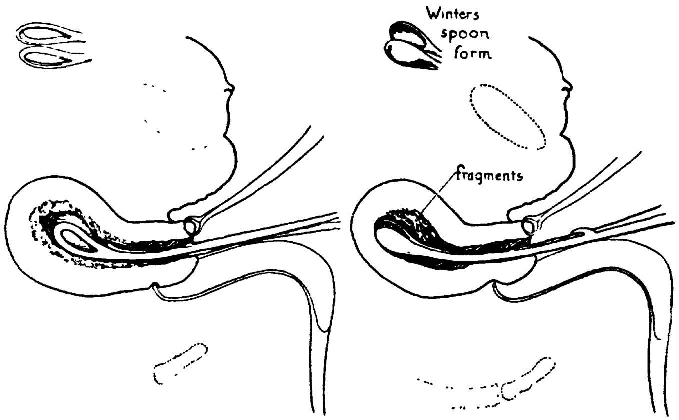


63 Emptying uterus with finger.


64 Attack on anterior wall with shank curved. Cervix is drawn down by tenaculum Knob on shank([illegible])gauges depth.

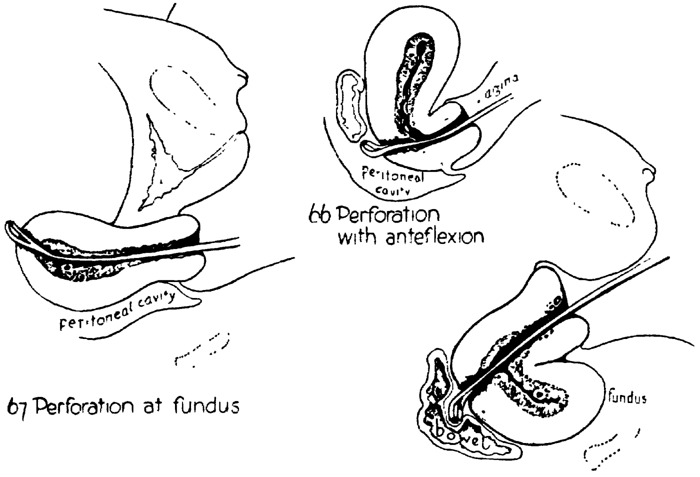
65 Attack on posterior wall with straighter shank: anterior wall cleared uterine wall relaxed, cavity large

Abortion: curette removes decidua


69 Forceps seizure of ovum (and decidua)

70 Forceps searches for fragments

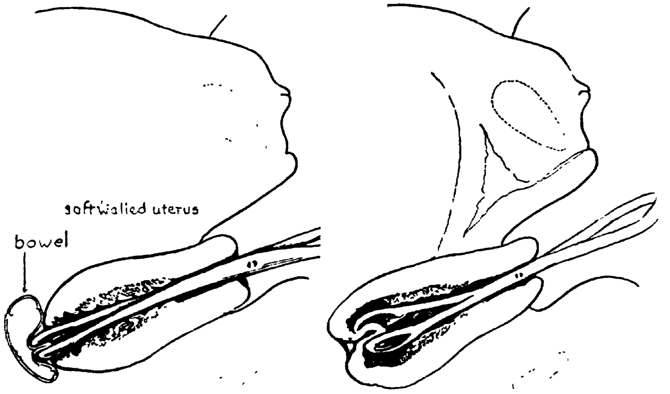
Abortion, forceps removes ovum and decidua.


67 Perforation at fundus

66 Perforation with anteflexion

68 Perforation with retroflexion

Abortion, curette enters abdominal cavity

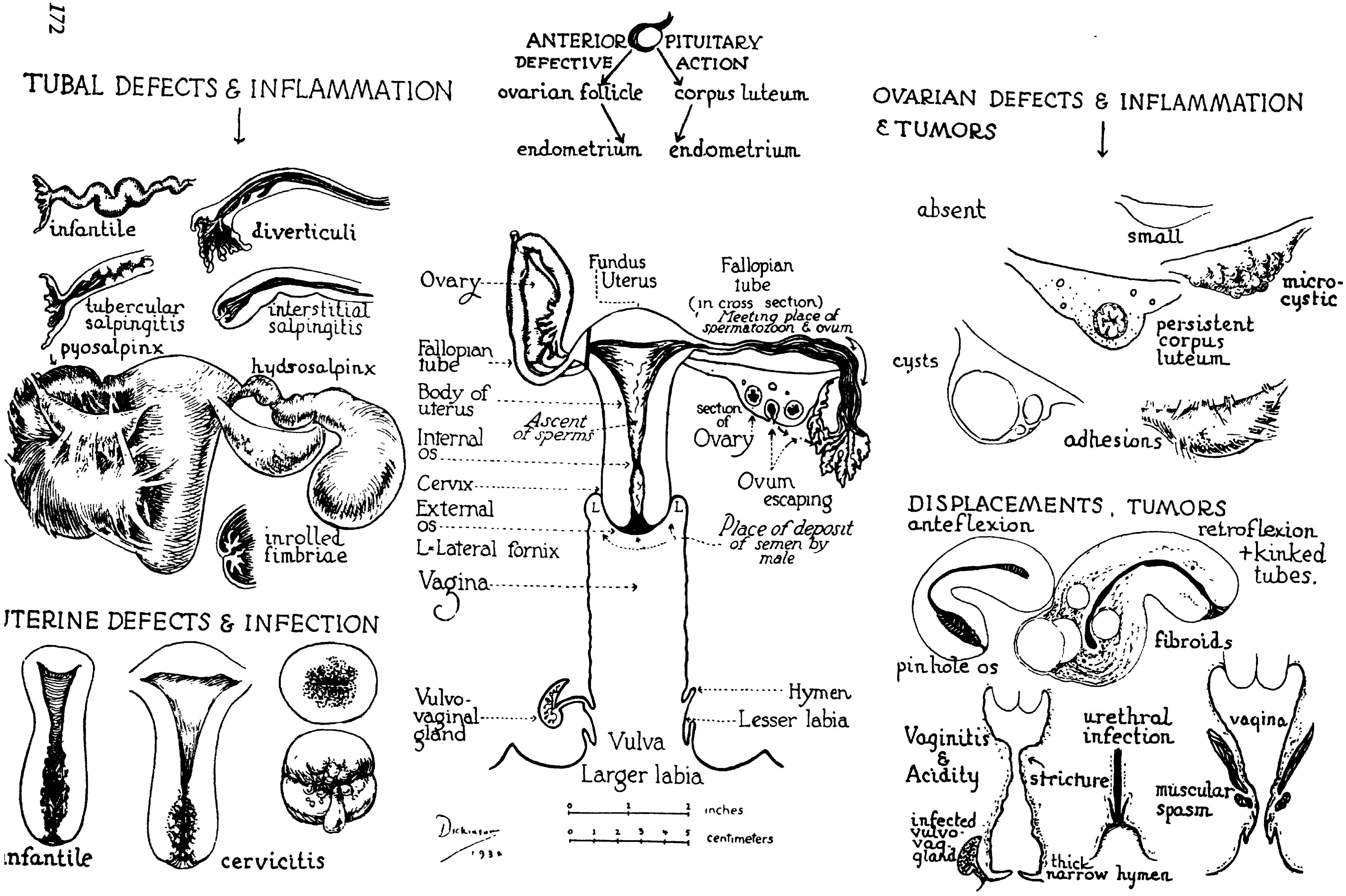

71 Forceps penetrates and seizes bowel

72 Forceps grasps relaxed wall

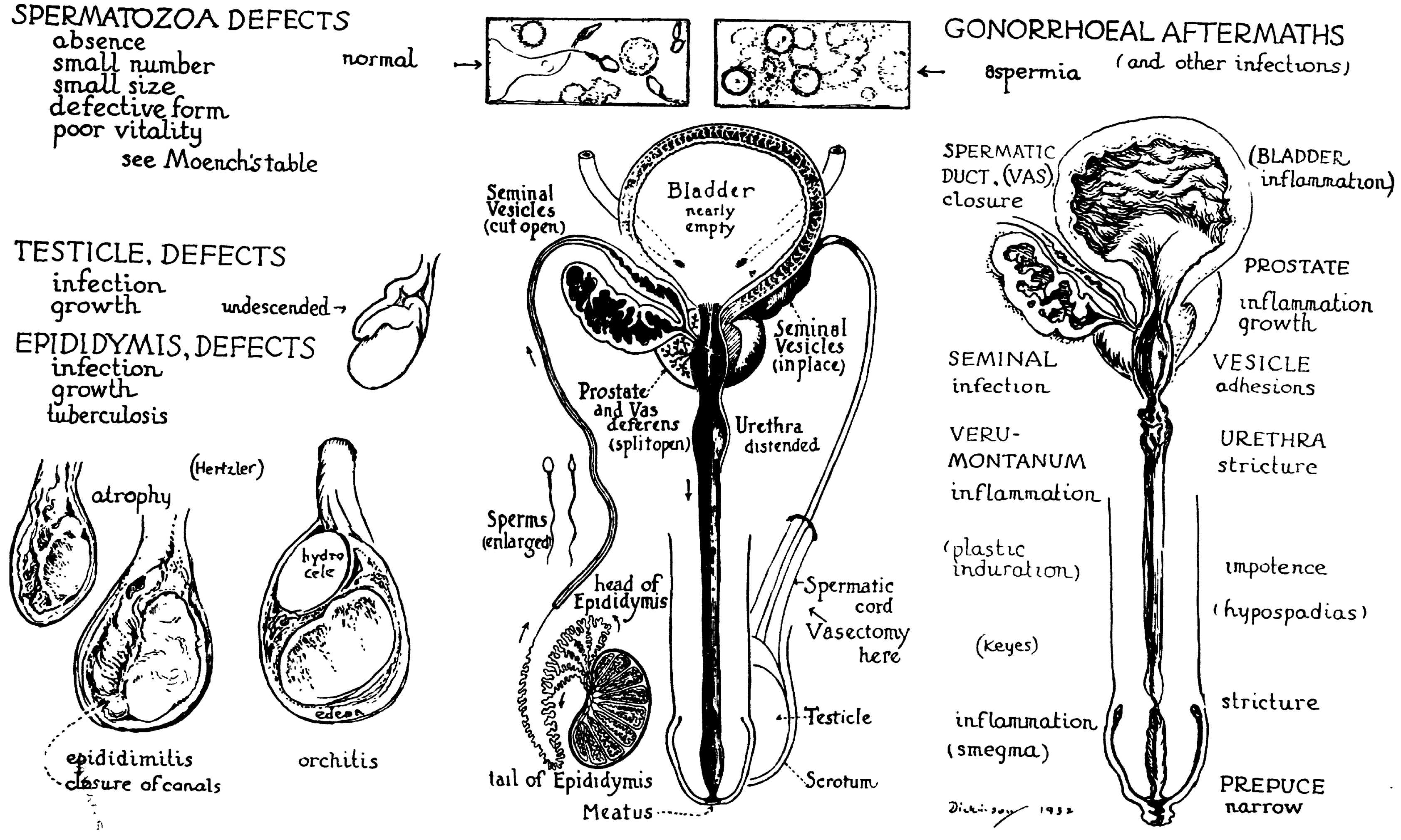
Abortion, forceps accidents

Fig. 171

Fig. 172

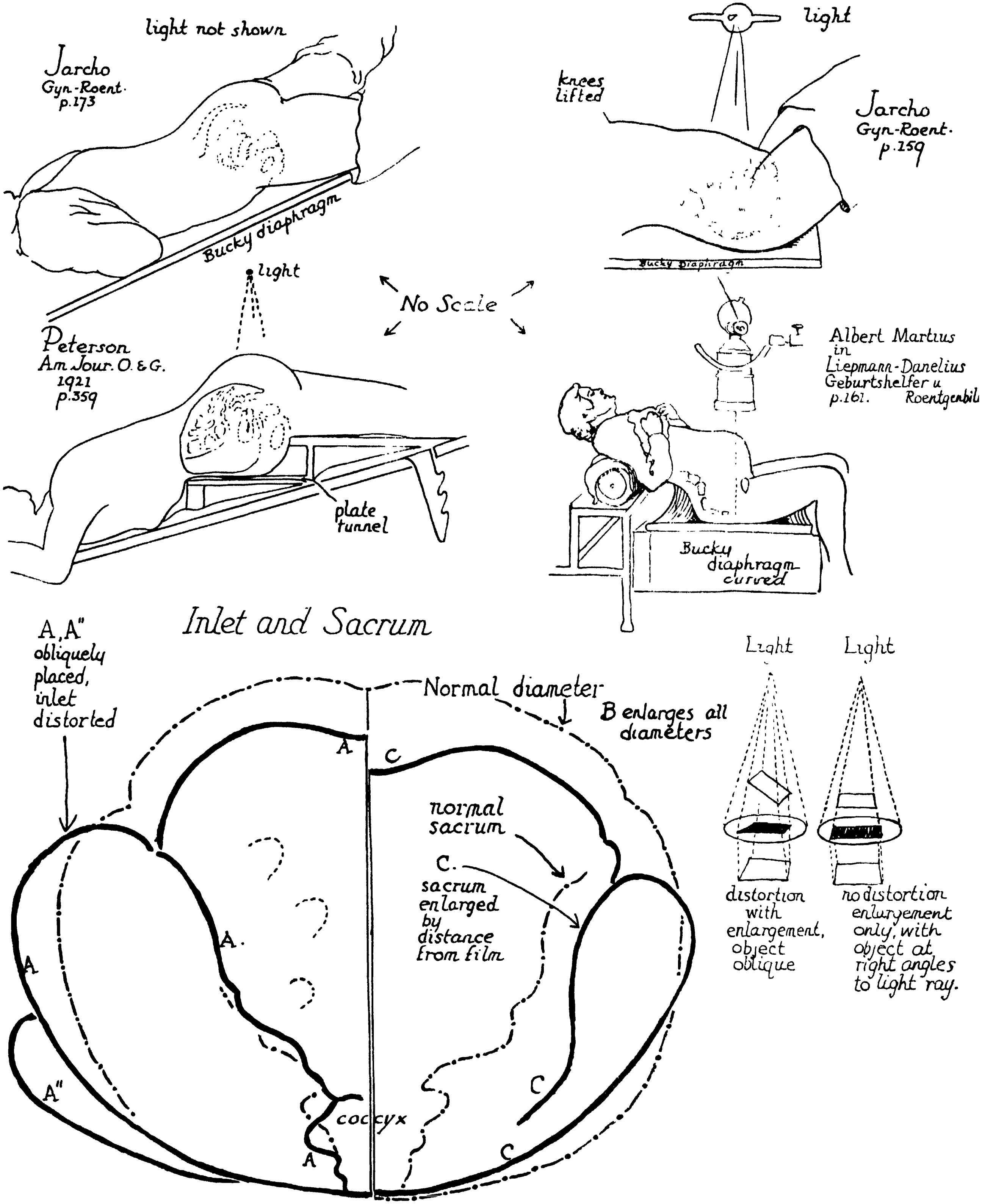


Anatomy of Sterility; Female



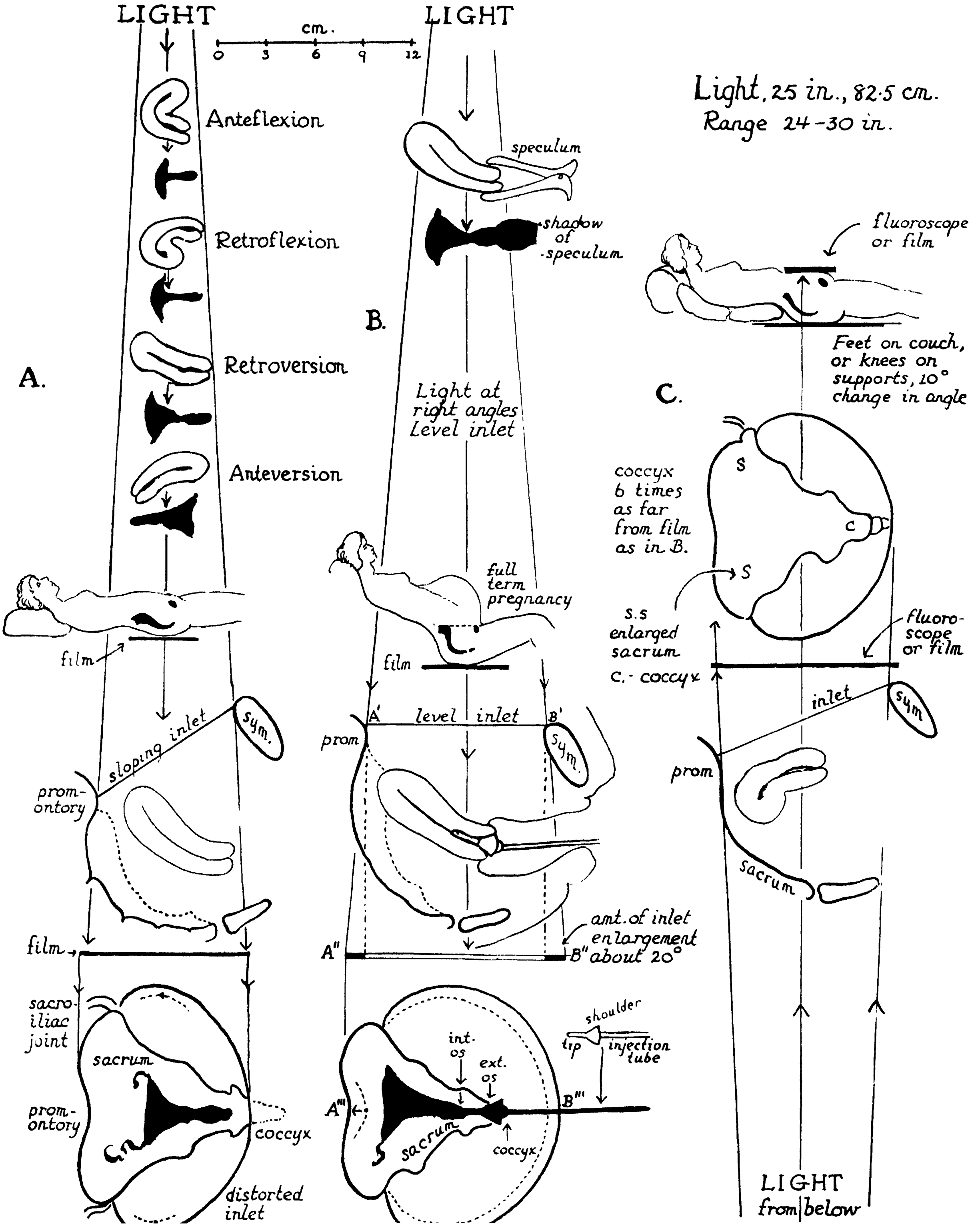
Anatomy of Sterility in the Male

Fig. 173



Roentgengrams of pelvis and contents; methods & distortions.

Fig. 174



A. On back, legs straight **B**. Sitting; inlet level C. On back, legs straight.

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